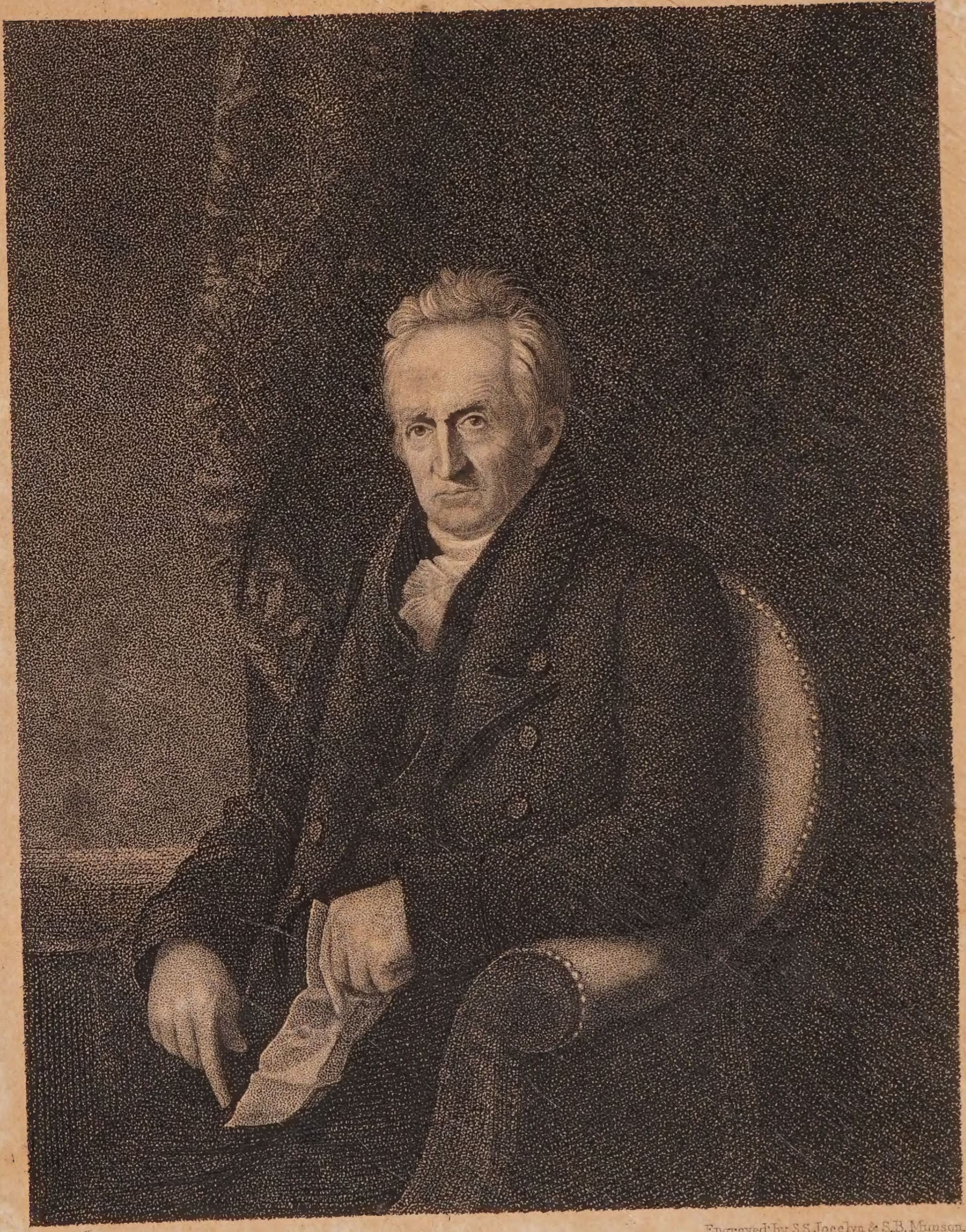

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NATHAN SMITH, M.D.

LATE PROF. OF SURGERY AND THE PRACTICE OF PHYSIC

IN YALE COLLEGE.

MEDICAL AND SURGICAL

MEMOIRS,

BY NATHAN SMITH, M. D.

LATE PROFESSOR OF SURGERY AND OF THE THEORY AND PRACTICE OF PHYSICK IN YALE COLLEGE.

EDITED WITH ADDENDA,

BY NATHAN R. SMITH, M. D.

PROFESSOR OF SURGERY IN THE UNIVERSITY OF MARYLAND.

Baltimore:

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MDCCCXXXI.

DISTRICT OF MARYLAND, TO WIT:

BE IT REMEMBERED, That on the twenty-fifth day of January, in the fifty-fifth year of the Independence of the United States of America, Nathan R. Smith, M. D., of the said district, has deposited in this office, the title of a book, the right whereof he claims as proprietor, in the words following, to wit:

"Medical and Surgical Memoirs, by Nathan Smith, M. D., Professor of Surgery and of the Theory and Practice of Physick in Yale College. Edited with Addenda, by Nathan R. Smith, M. D., Professor of Surgery in the University of Maryland."

In conformity to the Act of the Congress of the United States, entitled "An Act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies, during the times therein mentioned;" and also to the act, entitled "An Act supplementary to the act, entitled "An Act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies during the times therein mentioned;" and extending the benefits thereof to the arts of designing, engraving, etching historical and other prints."

PHILIP MOORE,
Clerk of the District of Maryland.

TO

GEORGE C. SHATTUCK, M. D.

OF BOSTON,

MY EARLY FRIEND, AND MY FATHER'S FRIEND,

THESE PAGES ARE GRATEFULLY INSCRIBED.

N. R. SMITH.

PREFACE.

It had been the intention of Professor Smith, for several years previous to his death, to furnish for publication a volume of Essays on those topics in medicine and surgery, in relation to which his abundant experience had furnished him with numerous facts, and qualified him to speak with confidence. An original and inventive faculty was a characteristic trait of his mind; and, however familiar he might be with the doctrines and practices of others in relation to particular subjects, he never failed to exercise his own judgment, where the rationale seemed unsatisfactory, and to resort to new expedients, when the means prescribed were observed to fail.

Of authors, there are two classes, the qualifications of which differ exceedingly, though both render important services to the cause of science. The one,

by extensive research, treasures up the numerous facts which, from various sources, are contributed to the common fund of knowledge, and presents them in a natural and intelligible order. The other class is bent upon the discovery of new truths, and ambitious to enlarge the boundaries of knowledge. For the former task, Professor Smith was by no means qualified, either by inclination, or habits of application. For the latter, his abundant experience and intellectual propensities peculiarly fitted him.

The reader will therefore discover that, in the following essays on medical and surgical subjects, no display of learning has been attempted; nor, indeed, has the writer aimed to present even an abstract of all which has been heretofore written on the topics discussed. His remarks are offered as supplementary to that which we already possess; though sometimes they are designed to subvert popular errors, and then the doctrines and practices of others are discussed, as far as may be necessary to contrast them with his own opinions.

I have considered it a sacred obligation to accomplish the publication of this work, because I thus fulfil his own design. I am encouraged also in the undertaking, by the numerous solicitations which have been made for its publication in those sections of our country where the reputation of the author was best known.

Lastly, I am influenced by the hope, that the posthumous works of one who, during life, gave his labours unreservedly to his fellow men, may render some benefit to his family.

NATHAN R. SMITH.

BIOGRAPHIC MEMOIR

OF

THE AUTHOR.

THERE is a class of men whose history should never be withheld from the public, even although it may not abound in remarkable incidents. They are those who have risen to honourable distinction by surmounting peculiar difficulties. The lives of such are fraught with information, both interesting and instructive. That individual must have a dull sense of moral sublimity, who sees nothing to admire in the strife which the good and great are often compelled to wage against adversity. If such a subject be worthy of divine contemplation, certainly it should be doubly interesting to those who derive practical instruction from it. When we behold men of great moral intrepidity and fortitude, encountering and overcoming difficulties of an uncommon and formidable character, we are taught to look with contempt on the trivial embarrassments, of which even the fortunate too often complain; and should we, too, encounter obstacles of threatening magnitude, the example of those who have surmounted the same, will rekindle our zeal, and cheer us with the accents of hope.

Had my father begun his professional career under those auspicious circumstances which his labours have bestowed upon so many others, even had he attained

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the degree of reputation which is now awarded to him, I should have regarded his history, though interesting to his friends, as comparatively of little moment to the world.

The late venerable President Dwight, who honoured my father with the warmest friendship, was accustomed, when instructing the senior class of Yale College, frequently, in order to awaken their ambition, and to encourage them in surmounting difficulties, to point out to them living examples of individuals who had acquired distinction under adverse circumstances. After havng become acquainted with my father he used, every year, to give a brief sketch of the events of his life. This circumstance encourages me to believe that these memoirs may not prove unprofitable.

In him the energies of a vigorous mind, for want of the quickening influence of early education, were dormant till comparatively a late period in life,—a period at which the elastic spring of superior youthful intellect is ordinarily impaired, if it has not yet been called into exercise. There are certain faculties and propensities of the mind of which the possessor may be totally unconscious, till some genial influence shall quicken them into life. Happy are they whose latent genius meets with its kindred stimulus "while life is in its spring"—while the ardent zeal and romantic ambition of youth impel the mind to the exercise of all its energies. But the embryo of *his* genius never felt a fostering ray till the period at which the intellectual character of most men is unalterably fixed. It was at the age of twenty-four that my father first saw, by mere accident, a surgical operation. This awakened in his mind a philanthropic ambition,

which never slumbered to the day of his death,—an actuating principle that carried him through toils and difficulties which would have appalled and discouraged an ordinary mind, till at last it elevated him to distinguished honour, and extended usefulness.

When these aspirations were first awakened, every thing was calculated to subdue and defeat them. He had no friend to cheer him on his way, for all disapproved of his unseaonable enterprise;—he had no education but the common rudiments acquired at a country school;—he had no pecuniary means but such as were acquired by the labour of his own hands. Fortunately for him (although it would have discouraged others) the physician, to whom he applied as a preceptor, refused to receive him till his preliminary education should be more complete. That gentleman supposed that this would be a sufficient repulse, and his surprise was great when my father presented himself with the necessary qualifications. He finished his office studies,—toiled on foot in a laborious practice, with the noble avarice of obtaining means to perfect his education—availed himself of the advantages which the infant schools of his own country then furnished—sought the more approved sources of knowledge in foreign parts—returned to his country, not alone to avail himself of it, but to diffuse it with untiring zeal. He was instrumental in founding colleges of medicine, which now flourish, as his noblest monuments, in almost every state of New England,—he extended the boundaries of the science which he taught—and, at length, he acquired a rank both as a teacher and a practitioner of medicine, which it is no disparagement to others to say, was second to that of

no individual in New England. Benevolence was with him not a less powerful actuating principle than honest ambition. Never, when contemplating his eminence and usefulness, did he seem to say "what is all this worth?" The honourable poverty in which he died, after toiling enough to have accumulated three fortunes, is the best eulogium upon the character of his heart. He has gone to his grave, honoured and blessed, and has thus bequeathed to his family and friends, a legacy dearer than wealth.

A plain, unvarnished, and concise narrative of his life, is all that I desire to give, and I prefer to give it in the language of another, who will "nothing extenuate nor set down ought in malice." His friends ask not the language of panegyric. There is, indeed, as we believe, that which will "sooth the dull cold ear of death" —which will quicken the silent dust, but it is not "flattery," nor is it "honour's voice," however triumphant may be the strain.

The following elogium pronounced by Professor J. Knight, of Yale College, my father's associate and friend, details, neatly and succinctly, the principal events of his life, and gives a sketch of his character. A few supplementary remarks I shall subjoin.

Friends and Fellow Citizens.

THE occasion which has brought us together is one of solemn and mournful interest. We are assembled to pay the last tribute of respect to the remains of one, in no ordinary degree, useful and beloved. Why one so beloved, so respected, and so useful, should be removed, when, to all human view, in the midst of his

usefulness, is one of those mysterious dispensations of a wise providence, which short-sighted man can neither fathom nor explain. It becomes us to be thankful to the Giver of all good, that he raises up wise and good men among us; that he suffers them to remain, until by their example they excite, and by their instructions, they prepare others to walk in their steps: and when He sees fit to remove them, to say with humble submission, Thy will, O God be done.

When a man, who has been widely known and beloved; who has exerted an extensive and beneficial influence over the interests of an important profession; who by the exertion of skill, assiduity and benevolence, has acquired the affections of a large and enligtened community, is removed by death, public opinion requires, and inclination dictates, that some testimonial of his worth should be brought forward, by those who, having been associated with him, are supposed to know him best. This duty, with respect to our deceased friend, has been assigned to me. For the imperfections of its performance, the circumstances in which it is undertaken will be a sufficient apology.

The subject of these remarks was the son of respectable parents, in moderate pecuniary circumstances, who at the time of his birth resided in Rehoboth, Mass. He was born on the 30th Sept. 1762. While he was yet young, the family removed to Chester, Windsor Co. Vermont, where his parents remained until their death. Of his early life little has reached us, except that his time was spent, in acquiring the elements of education at the ordinary country schools, and in agricultural pursuits on his father's farm.

Before he arrived at the period of manhood, in some of the latter years of the revolutionary war, he joined a body of the Vermont militia, which was stationed on the frontiers of that state, to repel the incursions of the Indian tribes of the neighborhood, and to keep them in check. How long he continued in this service is not known. He frequently alluded to the hardships and privations which he endured, while encamped in what was then a wilderness, with few of the necessaries, and none of the conveniences of life. While on this expedition he was shot at, and narrowly missed, by an Indian lying in ambush. These privations and dangers, were not however peculiar to him, but were endured in common with many thousands of others of the hardy and enterprising inhabitants of our frontier settlements, during that perilous period, when property and life were exposed to all the dangers of savage warfare.---- While residing at his father's, a portion of his time was occupied with what was then almost a necessary employment; securing the game, and destroying the beasts of prey of the neighboring forests. In these pursuits, small parties of young men were often absent from home for many days. On one of these excursions, he was left by his companions, in mid winter, at a distance from home, with a slender stock of provisions. While waiting for their return, his supplies were exhausted, and what was more unfortunate, a sudden thaw came on, which softening the surface of the snow, then many feet in depth, rendered travelling impracticable. Here he was detained several days, subsisting entirely on the unsalted flesh of some game which he had taken. By the time the impediments to travelling were removed,

he found himself afflicted, in consequence of exposure and improper food, with a severe and distressing disease. With difficulty he reached the nearest house, where, and at his father's, he was, for many months, confined by sickness. Thus his life passed on, in a course of laborious industry, and of hardy enterprize, until he arrived at the age of twenty-four years. What his mental acquirements at this period were, we have no means of judging. And, although from the limited means of instruction which he enjoyed, we cannot rate them high, yet, from the fact that he was engaged during some of the winter months, as teacher of a school in the vicinity, we are warranted in the belief, that they were more than were ordinarily obtained by the young men of the period, in that country.

At this time an event occurred, which gave a new direction to his thoughts and his life. This event, trivial in its nature, and apparently casual, led him to the study, and finally to the practice, of a profession, which for more than forty years, he adorned and improved.—The events to be stated, add one more to the many well known cases, which shew, by how small an apparently inoperative means, a wise overruling Providence, controls and directs the affairs both of individuals and of nations. Mr. Smith was present, almost without design on his part, at a surgical operation performed by Dr. Josiah Goodhue, then, and for years afterwards, the most celebrated surgeon in that region. By witnessing this operation, his attention was directed to the structure of the human body, and his curiosity excited to learn more of a subject at once so novel and interesting. Shortly after, he mentioned to Dr. Good-

hue his desire to engage in the study of medicine, and requested permission to enter his office as a student.—The Doctor judiciously inquired of him, for they were almost strangers to each other, what had been his previous course of life, and what were his acquirements. The reply was, until last night, I have labored with my hands during my life. Dr. Goodhue told him kindly, that he was not in the habit of receiving young men as students, who had not received some preparatory education: giving him as the reason for this, that the profession of medicine was in a low state in that part of the country, and that to elevate it in reality and in public estimation, young men properly qualified only, should be encouraged to engage in it. In conclusion, he stated to Mr. Smith, that if he would place himself under the tuition of some person capable of instructing him, and acquire so much literary information, as would enable him tó enter the freshmann class of Harvard College, he would then receive him as a student. This judicious advice was happily followed. He selected the Rev. Mr. Whiting of Rockingham, Vt. as his instructor. With him he remained until the required condition was fulfilled. For three years after this he was a pupil of Dr. Goodhue, then residing in Putney, Vt.—The assiduity and success with which he pursued his prefessional studies, are fully attested by his instructor, who always regarded him, with that esteem and affection, which can be excited in the mind of an instructor, only by diligence and good conduct on the part of the pupil. These kind feelings were fully reciprocated by Dr. Smith. He always spoke of this, his early friend, in the warmest terms of esteem and gratitude, as well

for his early advice, as for his subsequent instruction, and for his countenance and support after he engaged in the practice of his profession. That respectable gentleman still lives, and will mourn at the tidings of the death of a favorite pupil and devoted friend.

Dr. Smith commenced the active duties of his profession at Cornish in N. H. After practising, with what reputation or success we are not fully informed, for two or three years, he visited Harvard University, for the purpose of availing himself of the advantages which that celebrated institution afforded. Here, he attended the several courses of Lectures on Medicine and Surgery, as well as those on Natural Philosophy, and other means of instruction, to which persons, not members of the academical department could gain admission. At the close of the term at Cambridge, he read an inaugural dissertation on 'The circulation of the blood,' which was received with high approbation, and, at the request of the faculty was published. Having received the degree of Bachelor of Medicine from this University, he returned to Cornish, and engaged anew, with increased information and enlarged means of usefulness, in the practice of his profession.

At this period the medical profession, in that vicinity, was at a low ebb. The country itself, was to a great extent a wilderness, throughout which, were interspersed flourishing towns and villages. This state of the country was a type of the medical profession. The large majority of the physicians were uneducated and unskilful. This was true with respect to all of New Hampshire, except Portsmouth and its vicinity, as well as the neighboring state of Vermont. There were

Physicians and Surgeons, respectable for their talents and attainments, scattered over this region; but they were few when compared with the whole number. This state of his favorite profession was painful to the benevolent and enterprising mind of Dr. Smith. Instead of merely taking advantage of it, to elevate himself by the ignorance of others, he early engaged, with his usual vigor, to correct it. The most obvious and effectual means to remedy this evil, was to furnish those who were about to enter upon the profession, with an opportunity of obtaining a correct professional education. To accomplish this object, he projected the plan of a Medical Institution in connexion with Dartmouth College, located at Hanover in New Hampshire. The plan was soon completed, and Dr. Smith was appointed professor of medicine. For several years the business of instruction in the various branches of Medicine and Surgery, as well as the auxiliary sciences, was performed by him alone. To qualify himself more thoroughly for this employment, which he probably foresaw was to occupy a large portion of his future life, he determined to derive larger stores of knowledge from what had been long considered as the fountain of medical science; the school of Edinburgh. He accordingly left a practice which had then become lucrative, and again became a pupil, seeking instruction from those who were well qualified to give it. He spent about a year in Great Britain, partly, in attending a full course of the Medical Lectures in Edinburgh, where the elder Monro and Dr. Black were then active teachers; and partly, in witnessing the practice of the hospitals in London. That this visit was full of interest and improvement to

him cannot be douted. He was perhaps in the best state to be improved by it. He was of mature years, had studied and practised enough to know, not only in general what every physician should learn, but what in particular was necessary for him; and he was ardent and zealous in the cause of his profession. His course, after his return to his native country, was one of almost unrivalled success. The medical school, which he was the means of establishing, flourished in a high degree, under his auspices, and those of the able professors who were, in the course of a few years, associated with him. The number of pupils, which for several years after the establishment of the school, was about twenty, gradually increased, so that for many of the last years of his connexion with it, the average number was not far from sixty. These, upon the completion of their education, were scattered over the neighboring parts of New Hampshire and Vermont, and other more distant places in New England. They gradually occupied the stations, rendered vacant by the death of the older members of the profession, and by the loss of business of those who were incompetent. Thus, that portion of the country became filled with a race of young, enterprising, intelligent physicians, who all justly looked up to Dr. Smith as their friend and professional father. This, together with his deservedly high and continually increasing reputation, as a kind, attentive, and skillful Physician and Surgeon, necessarily drew upon him a vast amount of business. Every Physician, especially all who had been his pupils, desired him as their counsellor: the sick and the friends of the sick, looked to him as their last resort in all cases of difficulty.

The labor which he endured in traversing, for the most part on horseback, such an extensive country, then, in part, almost a wilderness, over mountainous regions, and roads which were often nearly impassible, at every season, and in every vicissitude of weather; the good which he accomplished, in affording advice and instruction, and by imparting a portion of his own vigor and energy to the younger members of the profession, as well as the more direct benefit which he afforded to the sick and distressed, can scarcely be estimated.

Thus he continued his laborious and successful exertions in the business of instruction at Hanover, and in the practice of his profession, in that vicinity, until the autumn of 1813. At this time, he accepted the invitation, which had been previously given him, to occupy the chair of a Professor, in the Medical Institution of Yale College, then just established in this city. From that time to the present, he has delivered an annual course of lectures, on the Theory and Practice of Physic and Surgery, to the class of Medical Students in this Institution. Since that period, he has also delivered a course of lectures on the same branches, at Dartmouth College; one at the Vermont University in Burlington; and two at the recently established and flourishing Medical Institution of Brunswick College in Maine. To trace the career of Dr. Smith, as an instructor, and as a practitioner of Physic and Surgery, since his removal to this city, would be only to repeat the account which has been given of him, while residing in Hanover. To this place have resorted for many years past, from seventy to ninety young men; and it is no injustice to Dr. Smith's associates to say, that a principal object has

been to learn from his wisdom and experience, the practical parts of their profession. Here, the sick and unfortunate, from every part of the country, have collected, to receive the benefit of his skill. In addition to his practice in the immediate vicinity, he has been called to visit, professionally, every county, and almost every town in this state, as well as many more distant places in the neighboring states. Thus his life has been one continued scene of active, laborious and useful exertion.

Such as he has been for many years past, so useful, so honored and so beloved, we fondly hoped he might continue to be, for many succeeding years. But alas! our hopes are blasted. The last dread summons has reached him; his spirit has ascended to him who gave it, and his body must return to the dust from which it sprung. By this melancholy event, a bereaved family is called to mourn the loss of a kind and affectionate husband, a tender, indulgent and well beloved parent; the institution with which he was connected, a chief pillar and support; the medical profession, a father and a friend; the poor, the sick and the distressed, a means of consolation and relief, and the community at large, a distinguished benefactor.

The story of his sickness and death will be brief. About the middle of July last, he was seized with a severe illness, which after a short continuance, left him, but in a very debilitated state. From this state his friends perceived with alarm that he did not entirely recover. He continued to be weak, with occasional attacks of illness, through the remainder of the summer and autumnal months. Though enfeebled in body, his mind retained its usual vigor and activity, and unwil-

ling to yield to what he probably considered a trivial complaint, he continued, with the exception of a few days, his laborious employments. No considerable alteration in the state of his health appeared, until about four weeks since, when he was attacked with a severe influenza. This was accompanied and followed, by a painful and vertiginous affection of the head. By the use of remedies these symptoms were alleviated. On the evening of Tuesday, the 13th inst. he first perceived a slight numbness of the left hand, with a trifling indistinctness in his articulation. These symptoms of paralysis gradually increased, until the morning of the 26th inst. when the powers of life became exhausted, and at 6 o'clock, in the 67th year of his age, he slept the sleep of death.

That our deceased friend was no ordinary man, the brief story of his life already told, most conclusively proves. In early life he was a poor boy, in a comparatively obscure village, with a limited education, and still more limited means of advancing it. Thus he remained, until past the period when most men are fixed in their situation for life. At this time his mind received a new impulse. He resolved to render himself useful and distinguished. Having chosen his profession, he entered at once, with the decision which marked his character through life, upon the work of preparing himself for it. The means of acquiring an education were furnished almost entirely by his own exertions. He appears for many years, to have labored to acquire property, only to expend it in advancing his knowledge of literature and medicine. Following this purpose with untiring zeal, he obtained a medical education, such as

was then almost unknown in New England. With the same zeal, activity and intelligence, he entered upon the practice of his profession, and subsequently upon the business of instruction. By pursuing this course, his reputation gradually increased, until he became more extensively known, than any other medical man in New England. Indeed it is doubted whether any other man in New England, of any profession, possessed so large a number of personal acquaintances and friends.

His acquaintance was not only extensive, but reached to every rank in society. The poor knew him as their benefactor; the sick, as their skilful, attentive physician; the rich, were honored by his society; and the wise and the good, received him as their friend and companion.

At the same time his influence over medical literature was equally extensive. This influence was exerted, through his large acquaintance among medical men, by his advice and example, as well as more directly through the medium of the various medical schools, which were favored with his instructions. By means of his influence thus exerted, he effected, over a large extent of country, a great and salutary change in the medical profession. The assertion, that he has done more for the improvement of Physic and Surgery in New England, than any other man, will, by no one, be deemed invidious. If the accomplishment of objects so important; with means so limited; the raising and sustaining so high and extensive a reputation, from so humble an origin; the advancing in such a degree, one of the liberal professions, over so large a country, be

not marks of strong native talent, fostered by industry, I know not where indications of such talent can be found.

To form a correct opinion of the character of Dr. Smith, it will be proper to view him in the various relations which he sustained.

As a physician and surgeon, he early attained a high rank: a rank which he held through life. The present is neither the place, nor the occasion to inquire into his opinions upon medical and surgical subjects, nor upon his mode of practice. It may however be proper, as illustrative of his character, to investigate those qualities of his mind and habits of life, which raised him to this elevated station.

The first faculty of his mind which I mention, was a keen discriminating inquisitiveness into every thing submitted to his inspection. Nothing passed before him unseen or unheeded. This quality, which in a weak mind is mere inquisitiveness, exercised to gratify an idle curiosity, is in a strong mind, a principle of rational enquiry, seeking in every direction, for information to be applied to some valuable purpose. By the continual exercise of this quality, ripened into a habit of steady, fixed observation, he collected in his mind, not only the outlines of the diseases with which man is afflicted, but all the minute circumstances, relative to their causes, rise, progress and termination; and the effect of remedies upon them in their various stages.

Another faculty of his mind was a memory highly retentive. This is so nearly allied to the habit of observation just mentioned, and so certain is it that whatever we observe minutely, is long remembered, that we

are not surprised to find them so often associated in the same person. With him every fact which he observed, every truth which he heard stated, appeared to be impressed indelibly upon his mind. In the last years of his life, he would relate with wonderful accuracy, not only the great, but also the minute events which he had witnessed. Especially, he remembered the diseases which he had seen, in all their varieties; the surgical operations which he had performed, and the causes requiring their performance, with all the attendant circumstances of person, time and place. By the aid of this faculty, his mind became a store-house, well filled with facts suited to his necessities. From it he could, at will, draw forth materials to guide him in his practice; to confirm and to illustrate his opinions.

Another faculty, which contributed more than either of the foregoing to his eminence, was the power of reducing all the knowledge, which he acquired, whether from reading or observation, to some useful practical purpose. This is opposed to mere speculation. It does not enquire into matters which have no practical bearing upon the happiness of man; but it observes all things as they now exist, in the present age, and in this country. It looks upon the evils now to be remedied, and the blessings now to be enjoyed. It leads the physician, to view diseases and accidents, as they present themselves to his own eyes; and to summon together all the information and every fact which he possesses, to bear upon the case immediately before him. This faculty is familiarly called plain common sense. It was possessed in a high degree by Dr. Smith, in relation to all subjects connected with his profession. The same

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faculty was illustriously displayed, in the lives of Washington, Franklin, Sherman, Dwight and Whitney.

Another faculty possessed by the deceased, and which aided him much in his successful career, was an undaunted moral courage. The physician often feels it to be his duty to apply a powerful remedy, and the surgeon to perform a painful and hazardous operation, in cases where he can give no positive assurances of their success. The timid man shrinks from such high responsibility, and suffers his patient to be destroyed by disease. Such was not Dr. Smith. Having satisfied himself what course was best for his patient, he honestly advised, and fearlessly pursued it; regardless of the censure which might follow, should it prove unsuccessful. With him there was no hesitation, no wavering between duty and expediency; between the welfare of his patient and his own reputation. This conduct, in one who valued reputation so highly, is the strongest proof of the existence of that courage of the mind, so much more noble, and so much more rarely found, than mere physical valor.

To these intellectual qualities, were added others of a moral nature, which facilitated his progress, and rendered it more successful. I allude to the kindness, assiduity, and delicacy with which he treated his patients. In him kindness was a natural feeling, springing out directly from the benevolence of his disposition. This feeling, he doubtless cultivated from a knowledge of the effects which its expression produces, in alleviating the distress, as well of the body as the mind. In all his intercourse with the sick, the kindness of his heart beamed upon his countenance, and flowed fourth from

his lips. Their faces brightened, and their spirits were roused at his approach, not more by the relief which they expected, than by the kindness with which it was afforded.

The assiduity of his attention to patients dangerously sick, was unremitted. He watched at their bedside by day and by night, administering to all their wants, and performing the offices of a kind friend, as well as of a skilful physician.

The esteem and respect which he entertained for the virtuous female character, and the purity and delicacy of his conduct towards those who possessed it, rendered him highly acceptable to all such as their physician. The continual exercise of these feelings gained for him at once their confidence and esteem.

As an instructor, the reputation of Dr. Smith was high, from the time he began the business of instruction. Of the method which he adopted in relation to this subject, in the earlier part of his life, I have little information. The facts however, that for many years, he gave instruction upon all the branches of Medical and Surgical Science; that this instruction was acceptable to classes of intelligent young men; and that many who were thus instructed, have become eminent in their profession, prove not only versatility of talent, but variety and extent of information, with a happy method of communicating it. His mode of communicating instruction, since his connexion with the institution in this place, has been simple, natural and unaffected. He sought no aid from an artificial style, but merely poured fourth, in the plain language of enlightened conversation, the treasures of his wisdom and experience. He

occupied but little time with the theories and opinions of other men, referring to books, only for the facts which they contain; nor did he often indulge in theoretic speculations of his own; but gave principally the results of his practice and experience. His object was to instil into the minds of his pupils the leading principles of their profession; not entering fully into the details of the practice, but leaving it for them to apply these principles to individual cases as they should present themselves. These principles he would illustrate, by appropriate cases, furnished by a long course of practice; related always in an impressive, and often in a playful manner, so as at once to gain the attention, and impress the truth illustrated, upon the mind. He often urged upon them the necessity of correct moral deportment, of industrious habits, and especially of forming a judgment for themselves, concerning the cases which were presented to them.

He endeavored to inspire them, both by precept and example, with a love of their profession, with activity in the practice of it, and a zeal for the promotion of its best interests.

At the same time that he communicated to his pupils instruction, he gained their affection by the suavity of his manners, and by a course of conduct towards them, by which they were satisfied that he ardently desired their best interests. Of all who have been instructed by him, the number is small of those who were not his personal friends.

The various relations of life were sustained by Dr. Smith in an exemplary manner. As a citizen, the same spirit which prompted him to enlist in the service

of his country, when engaged in war, led him to support, by his influence, her free institutions in time of peace: as a lover of good order, he rejoiced in the enaction and the execution of wholesome laws and regulations; and as a friend of morality, he discountenanced vice in every form. The purity of his life, it is believed, arose not so much from the restraints of society, as from a purity of mind, which remained unsullied. So far as personal observation enables me to speak, he regarded the institutions and the ministers of religion, with the highest reverence. With regard to subjects of this nature, it is believed, that his last days were his best days.

In his relations to his fellow men, there are particular traits of his character, which ought not to pass unnoticed. He possessed strong social feelings and habits. Accustomed from early life to the society of men in every station, he entered readily into free and unreserved intercourse with all. In companies of every kind, learned or unlearned, polished or otherwise, his free conversation, his fund of anecdote, and the acuteness of his remarks upon all subjects, whether relating to the common affairs of life, or the more important concerns of morals and literature, rendered him a welcome guest. His manners, which were free, yet unpresuming, and unshackled by the forms of ceremonial observances, were such as to impose no inconvenient restraints upon others or upon himself. No one delighted more in social intercourse with his friends, and in a free interchange of feelings and opinions with them. This was one of the pleasures of his life, and this endeared him to those with whom he associated.

Dr. Smith was eminently a benevolent man. He regarded man as his brother, and when in distress, as a brother he afforded him relief. No one, it is presumed, ever heard him say to the destitute, Be ye warmed and be ye clothed, without at the same time furnishing the means of relieving their necessities. That his charity was always discriminating is not probably true. It was the charity of the heart, and not of calculation; and often his most valuable benefactions were rendered in the course of professional exertion.

The mere distribution of a portion of his property to those who were in need, was indeed, the least part of his beneficence. It is no difficult matter for those who receive, as a compensation for their labor, an abundant supply of all they need, unless their hearts are fast bound by the chains of avarice, to distribute a small portion of their substance to those who are in want. Indeed the selfish man often does this to rid himself of troublesome importunity. These merely, of their abundance, cast into the treasury. It is a far nobler charity, to relieve distress by personal exertions and sacrifices. The man, who to alleviate or remove the misery of his fellow men, exposes himself to cold, hunger, and fatigue, in visiting the abodes of wretchedness, penury, and even of guilt; who, when there, listens with sympathizing attention to the story of sickness, told by its miserable inmates; relieves by personal attentions their immediate sufferings, and cheers their hearts with assurances of future assistance, exhibits the fairest specimen of human benevolence. Surely, upon the head of such a man, the blessing of many ready to perish, will fall.

The sketch, thus feebly drawn, exhibits one feature in the character of our deceased friend. To him, the sick and suffering, whether rich or poor, were equally objects of attention and compassion. He regarded all alike, the rich, the poor, the beggar and the outcast, when his services were required to relieve their distresses. This with him was a matter of feeling, rather than the result of meditation. He did not serve the poor, that he might gain the favor of the rich, but to fulfil the desires of his own benevolent heart. He acted in accordance with an opinion which I have more than once heard him express, that the great object of the intercourse of man with his fellow men, should be to do them good.

Nor was his benevolence confined in its exercise, to the sick and the poor. It led him to rejoice in, and to promote by his influence and exertions, all plans, calculated, in his view, to promote the best interests of his fellow men. The interests of literature and sound morality, received his cordial and unvaried support. In regard to objects of this kind he indulged in no narrow, local prejudices; but looked abroad with an enlarged view, to the welfare of all, both of the present and future generations.

From the preceding statment, it cannot be doubted that Dr. Smith performed with fidelity the various relations of domestic life. That benevolence which was so active and so expansive, could not but shed its brightest and warmest rays, upon those who were the nearest and dearest to his heart. Why should I speak of him as a kind, affectionate husband, or as a tender, indulgent and judicious parent, who bore good will to all

mankind? Those towards whom he sustained these endearing relations, are witnesses of the manner in which he fulfilled the duties which they require. The affection and respect which they manifested towards him while living, and the mourning and tears which accompany his departure, bear testimony, that as he was abroad, so he was at home, the kind companion, instructor and friend.

The life of a man so illustrious as our deceased friend, imperfectly portrayed as it has been, is full of instruction. It teaches the young who are just entering upon the busy scenes of life, especially you, my young friends, who are preparing to engage in the same arduous profession, the value of enterprise, industry, and benevolence. By the exercise of these, he rose from obscurity to eminence. What hinders that you, by the judicious use of the same means, should not accomplish the same end. All cannot be equally eminent, but all may render themselves highly useful and respected.

It teaches all the folly of selfishness. He sought nothing for himself, but the reputation of doing good. This he obtained, as all others may, by deserving it; and with it, received all that he desired of this world's goods, the esteem, respect, and affection of a large and enlightened community; the approbation of the wise and the good, wherever he was known; and the assurance that his memory will remain a noble inheritance to his posterity.

If his life is instructive, not less so is his death. It adds one more lesson to the millions which have preceded it, teaching us the slight tenure by which we hold our mortal existence; and the necessity of prepar-

ing for that event, which happeneth unto all. The wise, the great, the good, and the useful, are removed in rapid succession, and why are we suffered to remain? Why! but through the good pleasure of him who waiteth to be gracious.

Although it would have been obviously improper to enter, in the body of this discourse, upon a consideration of the medical opinions and the modes of practice of Dr. Smith, a few remarks upon them, may not, in this place be unacceptable. Upon these subjects, I have no means of information at hand, previous to his removal to this city. The few remarks which are made, must therefore be considered as confined to the last thirteen years of his life.

All who have witnessed the practice of Dr. Smith, must have remarked the rapidity and decision, and, at the same time, the general accuracy, with which he formed an opinion on the cases of disease submitted to him. He appeared to strip diseases of all their adventitious attendants, and to seize, at once, upon their important and essential phenomena. This process was often so rapid, as to resemble more the effect of intuition, than the regular deduction from a train of reasoning.

With the same rapidity, he saw, as it were with a glance, the course proper to be pursued, and with equal promptness, applied the appropriate remedies. This course of practice, can by no means be held out as an example to the young and inexperienced; nor is it perhaps the best mode to be pursued by any one. It is justifiable only in those, whose habits of observation and discrimination, have been matured, by a long

course of enlightened experience. Even such would escape occasional errors, by more careful deliberation.

The practice of Dr. Smith in the treatment of acute diseases was essentially the same, as that of the other respectable physicians of New England; varied somewhat perhaps, by his notions of the nature of typhus, the prevailing fever of the country. What these notions were, and what his practice founded upon them was, he has fully explained, in his treatise upon typhous fever, published a few years since. If he had any peculiarities in the treatment of other acute diseases, than pure typhus, they consisted, in discarding the use of remedies comparatively inert, and in employing those which are more powerful and effective. He often asserted that the use of medicines, which, in common language, if they do no good, will do no harm, is usually the resort of timidity or ignorance; and that the physician who knows not when and how, to apply or to withhold the more powerful articles of the materia medica, was unfit for his profession.

In the treatment of chronic diseases, energetic remedies, especially such as acted powerfully upon the stomach and the other organs of digestion, were more especially resorted to by him. To this course, he appears to have been led, partly by his own reflections upon the nature and causes of most chronic diseases, and partly, by the situation in which he was placed, with respect to patients of this class.

Many of them consulted him after they had employed all the ordinary means of medication. Others still consulted him from such a distance, as precluded him from watching over the tardy effects of ordinary

remedies. Both these circumstances, combined, led him to the administration of full doses of the more effective medicines, with the view of producing speedy and great changes in the organs diseased.

For the duties of a practical surgeon, Dr. Smith was eminently qualified, and upon the manner in which he performed these duties, his reputation must, in a great measure, ultimately rest. To these, he brought a mind enterprising, but not rash; anxious, yet calm, in deliberation; bold, yet cautious, in operation. His first object was, to save his patients, if possible, from the necessity of an operation; and when this could be no longer avoided, to enter upon its performance, without reluctance or hesitation. In his operations, he was calm, collected and cautious.

He manifested no desire to gain the reputation of a rapid operator: a reputation, so ardently, and it is to be feared, so unfortunately sought for, by many surgeons of the present day. He who commences an important operation, with his eye upon the minute hand of a watch, starts in a race against time, in which the life of his patient is the stake, and often the forfeit. The true rule for the surgeon is, *sat, citó si sat bené.* Neither did he make any display, in the course of his operations, to gain the applause of bystanders. Hence there was no formidable array of instruments; no ostentatious preparation, so well calculated to excite the wonder of the ignorant, and to strike a dread into the mind of the patient. Every thing necessary was prepared, while all useless parade was avoided. When engaged in an operation, his whole mind was bent upon its proper performance. Every step was carefully examined,

every occurrence narrowly watched; and if any thing unusual appeared, he would ask the advice of those present, in whom he had confidence. In such cases, his promptness and decision, joined to what Chesselden calls "a mind that was never ruffled nor disconcerted," were of singular utility. By the aid of these, he could look, with a steady eye, upon the varying features of the case, as they rose to his view, and adapt his measures, at once, to every emergency. By this cautious mode of proceeding, calculated to gain, not the applause of those who were present on a single occasion, but the enduring reputation of a judicious, skilful Surgeon, he performed with great success, the most important operations. That his success was great is fully attested by the facts, that of about thirty cases of Lithotomy, only three proved fatal; and that in the course of his practice, he lost no patient of hemorrhage, in consequence of an operation, either direct or secondary."

In the practice of Surgery, Professor Smith displayed an original and inventive mind. His friends claim for him the establishment of scientific principles, and the invention of resources in practice, which will stand as lasting monuments of a mind fertile in expedient and unshackled by the dogmas of the schools. It is believed that he was the first in this country to perform the bold operation of extirpating the ovarian tumour. With him, the operation was altogether original, for although it had then been once or twice performed in Germany, he was, at that time, unacquainted with the fact. He was also the first to perform, in this country, the opera-

tion of staphyloraphy. Important scientific principles were developed by him in relation to the pathology of necrosis, on which is founded a new and successful mode of practice. He also devised and introduced a mode of amputating the thigh, which, although resembling methods for some time in use, is sufficiently original to bear his name.

The apparatus which he invented for the treatment of fractures, is altogether new, and has been adopted by some of the best surgeons in every part of our country as decidedly preferable to any in use. His mode of reducing dislocations of the hip is new, philosophical, and ingenious.

N. R. S.

A

PRACTICAL ESSAY

ON

TYPHOUS FEVER.

BY NATHAN SMITH, M. D.

Professor of the Theory and Practice of Physic and Surgery in Yale College.

PREFACE.

The following Essay on Typhus, first published in 1824, by no means claims to be considered a complete treatise on this extensive topic, or a digest of what has been written upon it. It was submitted to the profession rather as a report of facts ascertained by the author's own extensive observation and experience, and as a supplement to that which we already possess on this subject. While his incessant professional labors rendered it impossible for him to execute the former task, they were calculated to qualify him thoroughly for the latter. This was executed, as he informs us in his preface to the first edition, "under the constant pressure of professional business, and during a more limited period than I was desirous of devoting to it. This is the reason, if not apology, for any carelessness of style, or inattention to arrangement, which may be observed in it. Should I find sufficient leisure, I hope, at some future period, to enlarge the work and add more facts in illustration of its principles."

As the period of leisure, for which he hoped, never occurred, mine will be the melancholy duty of subjoining to the present edition such observations as I have heard him make in relation to this subject, since its first

publication, and also an occasional note in defence of the opinions which he adopted.

I trust that it will be borne in mind by all readers, that the author treats of Typhus as it presented itself to him, and not as he had studied it in books. His sketch is from nature, and if it occasionally differs from those which have been executed by other hands, it is because the aspect of the original is often modified by circumstances. The climate and soil of New England are peculiar, and we look for corresponding modifications of disease. It was the duty of the author, therefore, to present a faithful delineation from the thing itself. If he has omitted to describe certain symptoms described by others, it is because they did not present themselves to him. If he has omitted to mention remedies recommended by others, it is because he did not witness their effects.

N. R. S.

TYPHOUS FEVER.

HISTORY OF TYPHUS.

Typhus is a word of Greek derivation, which signifies *smothered fire*, or *stupor*. As applied to disease, it is doubtful whether it was originally meant to indicate internal heat, or whether it was used to denote a fever particularly affecting the mind, and producing stupor and coma.

With regard to the history of this disease, we have no account of its first appearance; on the contrary, it is always spoken of by the older writers as an affection well known. And from the additional circumstance of its having received its name from the Greek physicians, it is probable that it has occasionally afflicted mankind from time immemorial.

From the descriptions given of it by European writers, there cannot be a doubt that the disease called Typhous Fever in Europe, and especially in England, is similar to the one known by the same name here.

I have not been able to ascertain with much certainty, at what period it made is appearance among the Europeans, who first emigrated to America. For an hundred and fifty years after their earliest establish-

ment, there were few if any books on medical science published in this country, and no medical journals made their appearance till a still later date. Of course, all we know of the diseases of that early period has been collected from historical records, which casually mention times of sickness, but give us no descriptions, or at most imperfect ones, of their appearances and symptoms.

We have reason to believe, however, from these imperfect and broken accounts, and from oral tradition, that it was not long after the first settlement of the country, before the inhabitants were afflicted with what is now called Typhus, but which was then known by the various names of long fever, slow fever, nervous fever, putrid fever, &c.

Whether the Typhous Fever was originally a disease of this country, I have not been able to ascertain. Although I have made particular inquiries in various parts of the country, and especially near the borders of the Indian possessions, I have never found an instance of an aboriginal inhabitant having suffered from this disease. I have likewise consulted several physicians, who have lived many years in the vicinity of Indian tribes, and who have often visited them in sickness; they have all informed me, that they have never seen a native attacked with Typhous Fever.

I do not think, however, that my inquiries have been sufficiently extensive, positively to warrant the conclusion, however probable it may seem, that Typhus has never made its appearance among them.

Whether this disease is of universal occurrence, or is confined to any particular climate or latitude, as has sometimes been suggested, is a question which I am

not prepared to decide; but I have every reason to believe that it has prevailed in every part of the United States.

A late writer in one of our periodical journals, has advanced the opinion, that Typhus does not prevail in the warm season of temperate climates. This conjecture is unfounded, as I have seen it attended with all its characteristic marks in every month, and, I believe I may say with truth, in every day of the year. This fact might be attested by the whole medical faculty of New-England.

With regard to the liability of the two sexes, I am disposed to think there is not much difference in the number of each attacked, but more females are cut off by it than males, in consequence of its appearance during pregnancy and soon after parturition.

As to age, I have never seen a child nursed at the breast affected with it, but other physicians have; and those in whom I could place confidence have assured me that they have met with infants suffering under this disease; and if so, it may be said to attack both sexes and all ages, from the cradle to the grave.

Notwithstanding its general occurrence throughout the country, long periods of time have elapsed, in which it has not existed in particular sections of country of considerable extent.

When I commenced the practice of physic in 1787, in Cornish, N. H., a town situated on the banks of the Connecticut river, I was informed by physicians, as well as the inhabitants who had resided many years in that part of the country, that about twenty years previous, a fever, which they had called *nervous*, had pre-

vailed in that vicinity,—had soon after disappeared, and, for the twenty years next succeeding, had not returned in a solitary instance. It was eight years after, during which time I visited the sick pretty extensively in that and the adjacent towns, before I saw or heard of a single case of Typhous Fever. I was then called into a family, one member of which had died of this disease, and another then lay sick of it. Soon after, I left this portion of country, and was absent for about eighteen months, and was in consequence unable to trace the course of the disease; but in 1798, a year after my return, it made its appearance in the village surrounding Dartmouth College, twenty miles distant from Cornish, and in several neighbouring towns simultaneously. From that time to the present, a lapse of more than twenty-five years, I have never so far lost sight of the disease, as to be unable to follow its changes from one place to another, and to tell where it was prevailing.

During this same period, it has appeared in all the New-England states, and as far west as my knowledge extends. Indeed it seems to possess a migratory character, and travels from place to place, and, after remaining in one village for a longer or shorter time, as, from one year to two or three, it ceases and appears in another.

I have not observed that situation has any influence either in producing or preventing this disease. It affects alike persons living on mountains and in valleys, on plains and the banks of rivers, and on the borders of lakes and stagnant ponds.

And I have not perceived that occupation or habits

of life make any difference in their liability to receive this disease, nor has it in this country been confined to the poor and filthy; but affects nearly alike the rich, the poor and middle classes.

Contagiousness of Typhus.

That the Typhous Fever is contagious,* is a fact so evident to those who have seen much of the disease, and who have paid attention to the subject, that I should have spared myself the trouble of saying any thing with regard to it, did I not know that there are some physicians in this country, who still dispute the point; one, which I think can be as fully demonstrated, as that the measles, small-pox, and other diseases universally allowed to be contagious, are so.

The arguments usually brought against this opinion are, that in certain cases, we cannot trace the contagion to its source, and that many persons exposed to it, do not contract the disease. These objections might be advanced with equal truth against the contagiousness of all diseases; as it frequently happens, that one or more individuals in a family will escape an attack, though equally exposed as those who suffer from it.

A few instances, which have fallen under my own observation, would alone be sufficient to determine the question.

A young man, a pupil of mine, was attacked with the Typhous Fever, from which he recovered with

* Without going into a discussion upon contagion and infection, I would observe, that by a contagious disease, I mean simply, one that can be communicated from one individual to another.

difficulty. Some of his family, who lived about forty miles distant, came and took care of him during his sickness. Upon his recovery, they returned home in good health, but soon after sickened with the same disease, and communicated it to others, who had not been exposed in the first instance. From this, it spread to numerous other families in the vicinity, who had been exposed to the contagion. In the whole town where this occurred, there had been no case of Typhous Fever for many years, till brought there by the circumstances above related.

During the prevalence of the Typhous Fever in Thetford, (Vt.) a woman went there from Chelsea, about ten miles distant, to visit and administer to a sister sick of this disease. Upon her return, she was herself attacked by it and soon after died. Others of her family contracted it of her; and in about four weeks, there were thirty persons taken down with Typhus, all of whom had been exposed to the contagion.

A young man belonging to Plainfield, (N. H.) who had left his friends, and resided for some time in the western part of the state of New-York, returned to his father, who had a numerous family. He found himself unwell before he reached home—was immediately confined with Typhus, and soon sunk under the disease. In about four weeks after, I was called into the family, and found nine members of it sick of the same fever.

With a knowledge of these facts, and many more, equally to the point, it is impossible for me not to believe this fever contagious, though it may not perhaps

be so certainly and readily communicated as some other contagious diseases.*

Origin of Typhus.

Some physicians admit that Typhous Fever is often communicated from one person to another, who nevertheless suppose that it is frequently produced without any contagion or specific cause; that is, that it arises in many cases from errors in diet or exercise, from the effects of temperature, or what Sydenham would call an epidemic state of the atmosphere, from marsh miasmata, or confinement in close crowded apartments.—This is a difficult subject, and it is not easy to demonstrate that it is never produced by some or all of these

*Professor Smith's belief in the contagiousness of Typhus has not escaped the censure of reviewers. Since the non-contagiousness of Yellow Fever has been so satisfactorily determined, the contagiousness of all fevers has become an unpopular doctrine. The reader will observe that Dr. S. by no means asserts that Typhus is uniformly, and necessarily contagious, but only that it is so under peculiar circumstances. Such being the question, it appears to me that it is far easier to ascertain the affirmative, if it be true, by positive testimony, than it would be to determine the negative, if that were true. If three credible persons were to declare to me that they had seen, in this City, yesterday, an acquaintance of mine, and a hundred others should declare that they had not seen him, I should certainly believe the former, theirs being positive testimony, and that of the latter negative. When, therefore, as is the case, a few individuals present such unequivocal facts as those detailed by Dr. S. we cannot withhold our credencē, even although hundreds of others have never witnessed the same. They appear to me necessarily to lead to the conclusion that Typhus is *sometimes* contagious. This opinion is mentioned by some of the best authorities of the present day, among whom is the distinguished name of Hildebrand.

causes, and perhaps the circumstance of analogy is all that can be adduced against the assumption.

However, the fact already noticed, of the absence of the Typhus in a large section of country, for an interval of more than twenty years, would lead us to doubt the possibility of its being produced by any of the accidental causes above enumerated; for in such an extent, and among so many people, it is impossible but that some of these circumstances should have occurred—and the disease of course be produced. Besides, if it can be communicated from one person to another, it has a specific cause, and I know no disease that arises from a specific cause, that can be produced without the agency of that cause.

It has been suggested that Typhus occasionally arises from marsh miasmata,* the same which, under certain circumstances, produce intermitting and remitting fevers. A fact, which I shall here adduce, is strongly opposed to this hypothesis. On the Connecticut river, from Northampton, in Massachusetts, to its source, a distance of more than two hundred miles from north to south, and on all its tributary streams, on both sides, for an hundred miles in width, there has been no instance of any person's having contracted the intermitting fever, from the first settlement of the country to the present time; and yet the Typhous Fever has prevailed more or less in every township within that tract of country.

The Typhous Fever, as far as my experience, which has been considerable, enables me to judge, is a disease

*Good, *Study of Medicine, vol. ii. p.* 188.

sui generis, exhibiting as little variety in the different individuals affected by it, as some of the diseases which are acknowledged always to arise from contagion. If its duration is not so uniform as some of the contagious diseases, it is less irregular than others, which spring from specific causes, as for instance the intermitting fever.

Liability to Typhus.

There is another marked point of analogy between Typhus and the common contagious maladies, which is, that it rarely affects the same individual twice.—Those, however, who do not consider it a distinct disease, but only a state of fever, will probably differ from me in opinion on this point. For it is evident, that if we make the name of the disease depend on the presence of one or two symptoms, or on that indefinite thing or state called debility, we shall be liable to misname it, and that this is actually done, and in very many instances, there can be no doubt. Indeed, within the last year, I have been consulted in several cases of disordered secretions of the digestive organs,* which were called low nervous or low typhous fever, merely on account of the presence of a furred tongue, loss of appetite, and some degree of thirst. Several of these patients told me, that they had had one of these "low fevers" every year, for several years in succession. It is obvious that those physicians who have such vague and indefinite notions of fever, as to call a stomach af-

*"Acute disorder of the digestive organs" of Hall—On Diagnosis, part 2, p. 102.

fection, Typhus, would be equally liable to call other febrile complaints by the same name, and may imagine they detect its existence in the same individual many times.

My own personal experience is strongly in favour of the opinion I have advanced of the non-liability of the same individual, to a second attack of Typhus; for during the twenty-five years since I first attended patients in this disease, and in that time I have visited many hundreds, and have witnessed its prevalence several times in the same village, I have never known nor heard of its recurrence in the same person.

I once attended a numerous family, every member of which was sick of Typhus, except two, who escaped at that time; but two years afterwards, when the disease again appeared in that neighbourhood, those two individuals of the family, and those alone, were attacked.

In another family, which I attended, consisting of eight persons, five of the eight had the disease during the autumn, and early part of the winter, and recovered. The next summer, the remaining three and another person, who had been added to the family after the former sickness, were attacked by it, while all those previously affected escaped.

The experience above spoken of, in addition to these cases, and numerous others equally in point, forms a strong presumptive proof, that in this respect, there is an analogy between Typhus and the common contagious diseases.

Changes of Typhus.

Some late writers, have described a fever beginning inflammatory, and ending Typhus, and vice versa. Upon this point, I would observe, that in many if not all acute diseases, there is a marked difference in appearance between the rise and decline of the same disease, whether it terminates in death or recovery, and generally, the early part of all febrile affections is attended with more symptoms of inflammation than the latter. This is undoubtedly the case with Typhus; but such difference of symptoms in its different stages, should not induce us to give the disease different names.

As I consider Typhous Fever as arising from a specific cause, if it begins Typhus, or arises from such specific cause, I believe it to continue Typhus through its whole course. Variations, in severity or mildness, can make no specific difference in the disease.

Combinations of Typhus.

With regard to the combination of Typhous Fever with other diseases, the opinion has been often, and confidently advanced, that two diseases arising from specific causes could not exist in the same individual, at the same time. But however dogmatically it has been stated, it is nevertheless without foundation, since I have myself seen the Hooping-Cough, and the most malignant dysentery co-existing in the same person.* It

* *Extract of a letter from Daniel Sheldon, M. D., of Litchfield, Conn.*

"In the course of the year 1807, the mumps, hooping-cough and measles were all prevalent in this town, at the same time. The

has been stated by Mr. Harty†, that Dysentery and Typhous Fever often combine, and I can add my testimony to the same fact, for I have often seen a patient taken sick with all the characteristic marks of Dysentery, and after some time the dysenteric symptoms have wholly subsided, while those of Typhus have continued for many days, so strongly marked as to leave no doubt on my mind of the truth of Mr. Harty's position.

I have likewise often seen this disease attack persons under the influence of epidemic catarrh, and the symptoms of both diseases continue perfectly evident for some time.

From the view of this subject above taken, and the facts there stated, I consider Typhous Fever a disease *sui generis*, arising from a specific cause, and that cause contagion, and seldom affecting the same person more than once.

The diseases with which it is liable to be confounded, and for which it is often mistaken, are pure, unmixed

children of the Rev. Dan. Huntington, then a resident here, were subject to these complaints. One of them had the mumps, hooping-cough and measles at the same time; another, the measles and one of the other complaints, which, I do not now accurately remember. In each child, the peculiar symptoms and appearances of each disease were exhibited and strongly marked; and, so far as I observed, progressed together, without any mitigation or suspension of either. Each of the children, after the abatement of their disorders, had an inflammatory swelling about the neck, of considerable size, which suppurated and was opened."

† Observations on Dysentery and its combinations, by William Harty, M. B. London, p. 57, et. seq.

catarrhal fever, the acute stomach complaints above referred to, and those bilious affections, which take place in the latter part of summer, and the commencement of autumn.*

I have seen many cases of all these affections, which have been considered and treated as Typhus, by those who consider it as a mere state of fever, and not as a distinct disease, dependant on a specific cause.

It will be observed, that simple inflammatory fever is not mentioned as one of the diseases with which it may be confounded. The reason is, that no such disease has ever fallen under my observation.

Although I have practised physic and surgery for thirth-five years pretty extensively in all the New-England states, except Rhode-Island, and have lived in New-Hampshire, Vermont, Connecticut and Maine, I have never witnessed a single case of continued fever, except Typhus, which was not either the effect of contagion, as the small-pox, measles, &c. or evidently connected with local inflammation, and dependant upon it.

I do not mean to assert that Typhus is never connected with local inflammation; indeed I know that the reverse of this has been the opinion of some men of great observation, and that there are many phenomena, which serve to corroborate it; but if so, it differs essentially from that kind of sympathetic fever, attendant on

* It is a fact, favourable to the correctness of the author's opinions on this topic, that he has not neglected to notice, in relation to Typhus, that state of the mucous lining of the stomach and intestines, which the French pathologists regard as its cause. The frequent occurrence of gastric fevers, but of a character essentially difyerent from Typhus, was familiar to him. N. R. S.

phlegmonic inflammation, and on attentive examination, this difference will be sufficiently obvious.

Typhus, like the other contagious diseases, has a natural termination, and if it does not end fatally when uninterfered with, it gradually exhausts itself and disappears; at the same time, unlike those diseases, it is not restricted in its duration to so narrow limits.

So far as I have observed, it has rarely terminated under fourteen days from its commencement, and seldom exceeds sixty. In a few rare instances, it may have terminated earlier or continued later. In one case which I visited, the patient had been confined an hundred days, and the symptoms still resembled Typhus, but the specific character had probably been changed, and these symptoms were rather the effect of the disease, than an evidence of its then actual existence.

Causes of Typhus.

With regard to the remote and proximate causes of this fever, which have been so often and diffusely described by the learned, if the remark made above be correct, contagion may be considered as the antecedent to all which follows its application, and that without it, no effect would be produced. But how this cause operates upon the system, or on what part it makes its first impression, or how this first impression produces the ultimate effects, we are wholly ignorant. As for the proximate cause, I know not how to separate it from the disease itself. Since the disease is known only by the phenomena it exhibits, these phenomena may be considered as constitutingthe disease, or all we know of it.

According to our late nosological arrangements, the Pyrexia, or febrile diseases, affect principally the circulatory system; if so, the affections of the other functions, are the consequence of the change first induced in this system. But as all the different parts of this system, are destined to perform different functions, it may happen that a disease may primarily affect one part only, and the change produced in the rest of that system, may be the consequence of a change produced primarily in another part.

In the sanguiferous system, the proper function of the heart seems to be nothing more than to receive the blood from the veins, and throw it into the arteries, which may be considered as living canals, intended to convey the blood from the heart to the system of capillaries. Here all the functions belonging to this system are performed, such as nutrition, reparation of the body, absorption, secretion and the production of animal heat. Of course, the functions of the heart and great arteries must be considered wholly subservient to those of the capillaries, which in reality, perform all the great and essential offices of the circulating system.

As this fever is supposed to make considerable change in the action of the circulating system, the question presents itself, what part is first affected? does the increased action of the heart and great arteries, cause the increased action in the capillaries, or *vice versa?*

In cases of local inflammation, which produce symptomatic fever, it appears very evident that the capillaries are first affected; the action of the heart and great arteries is not changed till symptomatic fever is produ-

ced; and that this symptomatic fever, seems to commence in the capillaries, is evinced by the paleness of the skin, and the chills with which its first appearance is accompanied.

The analogy between the inflammatory and febrile action is so great, that we may with confidence rely on the similarity of cause.

The paleness of the skin, and the sense of cold spoken of above, which attend inflammation, and precede the attack of fever, or the developement of those phenomena to which we usually apply the name, and which is followed by an increase of the action of the heart and arteries, I explain in the following manner. Before the diseased action can take possession of the capillary vessels, the natural and healthy one must cease, unless disease be a mere increase of the healthy action, which we have abundant reason to believe is not the case. It is during this interim, that is, between the interruption of the natural healthy action, and the complete establishment of the diseased one, that the patient feels the chill.

Something of this kind is observed in cases of local inflammation, which still continues to extend itself. A few lines beyond the discoloured part of the skin, between that and the portion which still retains its natural tint, there is a pale circle, evidently showing that the action of the capillaries in that part is suspended.

When local inflammation proceeds so far as to produce symptomatic fever, a degree of paleness accompanied by chills, precedes the increase of heat.

Upon the whole, whether we consider Typhous Fever as dependant on local inflammation or not, it is

probable, nay, it is very certain, that like all other febrile diseases, the morbid action commences and continues principally in the capillary system, and that the change which we perceive in the action of the heart and great arteries, is symptomatic of the disease existing in that system.

The most violent affections of the heart and large arteries, as in palpitation, do not produce the slightest symptoms of fever, which serves to show that these two parts of the circulating system have diseases as distinct and different from each other, as their functions.

Symptoms of Typhus.

The symptoms of this disease, may be divided into such as affect the functions of animal life, and such as affect those of organic life.

The changes produced in animal life, may be referred to affections of the mind, of the organs of sense, sensibility, and voluntary motion. Those occurring in organic life, to changes produced in the respiratory, circulatory and digestive systems, to secretion and excretion generally, together with its effects on the animal heat.

Amongst the earliest symptoms belonging to the first class, are dull, aching pains in the head, back and limbs, usually commencing in the head and back, but in some cases in the lower extremities, attended generally with a sense of lassitude and fatigue. The patient's flesh, as he often expresses it, is very sore.

The symptoms, as they appear in the nervous system, are a disinclination to make any mental exertion,

forgetfulness, inability to measure time, total incapacity to pursue any train of thought, or to attend to business. As the disease advances, delirium often makes its appearance, sometimes continuing day and night, at others, it is present in the night only. In a still more advanced stage coma supervenes, but not often so profound that the patient cannot be roused from it by speaking loudly to him, although upon ceasing to speak he immediately falls back into the same state.

In a few instances, I have known patients in their delirium impressed with an idea of some person having abused them; and this idea has continued till after they have recovered, and was even then obliterated with difficulty.

In two cases which I have met with, instead of delirium, a kind of insanity appeared pretty early in the disease; and in both, as the insanity came on, the peculiar symptoms of Typhus abated.

In one instance it was of a playful childish nature, in the other there was a display of great wit and humour.

In both it continued about four weeks, and as it then gradually subsided, a restoration to health took place.

There is in this disease not only a forgetfulness of the lapse of time and of occurrences that have recently happened, but though the patient appears sensible, and gives rational answers through the whole course of the disease; yet after his recovery, the whole time elapsed, and all the circumstances that have taken place during that period, are entirely blotted from the memory, and are never after recovered.

The hearing is often impaired, almost from the com-

mencement of the attack. Sometimes false hearing occurs, and the patient imagines he perceives voices and sounds when nothing of the kind exists.

The sense of vision is not so much impaired as that of hearing; and blindness, I believe, never occurs till near the point of dissolution. But false, double, and distorted vision sometimes arises.

To an observer, the eyes present a peculiarly heavy and languid appearance and are a little watery, but in the beginning of the disease, there is not much evidence of inflammation. The red vessels, however, on the conjunctiva are often a little enlarged, and appear more numerous than in a state of health. In the latter stage they become more turgid and of a darker colour.

The secretions of the mucous membrane of the eye are often considerably affected, become thick and viscid, and accumulating in its angles, dry and put on the appearance of scabs.

There is sometimes a considerable increase of sensibility to light.

The voluntary motions are unsteady, the tongue trembles when an attempt is made to protrude it, and the patient's hand shakes when he attempts to bring it to his head. There is often more or less starting of the tendons, and the muscles of the face are agitated, especially when asleep, so as to produce momentary distortion.

The voice is altered, from the beginning. Early in the disease it is usually rather plaintive and small, but as it advances, and more particularly in bad cases, it becomes guttural, and at last truly sepulchral.

The patient is generally inclined to lie on his back,

and he insensibly slides down towards the foot of the bed.

It has appeared to me, in some instances, that the moral principle has been affected. One patient in particular, who had been extremely sick with this disease, after his recovery had a strong propensity to steal, and did in effect take some articles of clothing from a young man to whom he was under great obligations for the care he had taken of him during his sickness. He at length stole a horse and some money, was detected, and punished. I took some pains to inquire into the young man's former character, and found it good, and that his family were respectable.

The symptoms of Typhus indicating a disturbance of the functions of the circulatory system are an increased frequency of the pulse, without fulness, or usually any considerable degree of hardness, from the commencement of the disease.

The pulse is generally rather easily compressed, and when the disease is severe, has often a peculiar, undulating stroke, or a second small beat following each full one.

The animal heat is always deranged in this disease. In the commencement, there is generally some degree of chilliness felt by the patient, although his skin feels warm to the touch. This sense of cold often continues at intervals for three or four days.

The heat on the surface of the body varies in intensity at different times of the day, and is greatest during the exacerbations, of which there are generally two in the course of twenty-four hours. They do not however appear regularly at the same hour each day, but vary

both in the times of their appearance and in their severity.

In the commencement of the disease the most marked exacerbation occurs oftenest in the evening.

The heat is ordinarily very unequally diffused over the body; sometimes the head and trunk will be excessively hot, while the extremities are cooler than natural; at others, the extremities will be preternaturally hot, when the body is but moderately so. One cheek will often appear of a deep red colour and be very hot, while the other remains pale and cool; as its colour and heat subside, they seem to cross over and affect the opposite cheek in the same manner. This colour and heat usually extend so far as to include the ear of the affected side.

Hæmorrhage is not an uncommon symptom in this disease. In a majority of instances in which it takes place, it arises from the intestines, not unfrequently from the nose, and more rarely from the kidneys.

In females of adult years it is often from the uterus.

This symptom is most apt to show itself at about the height of the fever.

Livid spots occasionally appear on the skin, and blistered surfaces sometimes become black and gangrenous.

The effect of Typhous Fever on the secretions is sudden and universal; they are all changed either in quantity or quality from the very commencement.

The saliva is generally diminished in quantity, becomes glutinous and produces great thirst; but in some cases its secretion is augmented and the patient spits great quantities of frothy mucus, without any desire to take liquids as in the other case.

The tongue, in the commencement of this fever, is covered with a white fur, which as the disease advances assumes a yellow tinge, and from that, gradually changes to a brown, which eventually becomes almost black.—Arrived at this state, it cracks and peels off, leaving the tongue smooth, dry, and very red. It is then again renewed and again comes off, making these changes, in severe cases, several times in the course of the disease.

The teeth are often incrusted with a brownish matter, which adheres to them closely, near the gums.

The fauces are covered with a thick tough mucus, which is sometimes thrown off in large quantities.

The urine is changed both in quantity and quality. In the commencement of the fever it is not high coloured, and is considerably copious, being often above the natural quantity, and deposits no sediment. In voiding it into a vessel it often foams like new beer. As the disease advances, the urine becomes more highly coloured, and as it begins to decline, lets fall an abundant sediment. In very severe cases, the patient evacuates his bladder but seldom, allowing the urine to accumulate there in very large quantities.

The changes produced in the functions of disgestive apparatus are a vitiated taste, want of all appetite and desire for food, and a total loss of the power of digestion in the stomach. Sometimes nausea and vomiting take place; whether this last is spontaneous or produced by art, the matter discharged shows, that the secretions of the stomach are entirely changed.

Sometimes, the matter thrown up consists wholly of vitiated mucus, at others, it is mixed with bile of an unhealthy colour and consistence.

The peristaltic action of the intestines is sometimes suspended and at others preternaturally increased, and whether the stools appear naturally, or are solicited by art, they are always liquid, generally of a dark colour, and have an unnatural and excessively fœtid odour.

The latter stage of all severe cases of Typhus is attended with diarrhœa; the stools are frequent, copious, liquid, and extremely fœtid. The bowels are often tympanitic, the flatus not passing off with the liquid stools.

The danger of the disease is in proportion to the violence of the diarrhœa; when the patient has not more than four or five liquid stools in the twenty-four hours, it is not alarming, as it does not seem to weaken him much, but if they exceed that number, serious consequences may be apprehended.

I have never lost a patient, whose bowels continued constipated through the whole course of the disease, and have never known a fatal case of Typhus, unattended by diarrhœa.

The respiration is always affected in a greater or less degree. There is generally a correspondence between the state of the respiration and that of the pulse, which is frequent and undulatory, when the breathing is hurried and unequal, or accompanied, as it frequently is, by occasional long and full inspirations like sighing.

After the patient has been sometime sick, if the disease proves severe, there is a peculiar whistling sound produced when he breathes through the nose, and when asleep or lying in a state of coma, the mouth is generally kept open and the breathing has somewhat of a stertorous sound.

In some instances, there is no sensible perspiration for several days succeeding the attack of the disease, in others, there will be more or less sweating about the head, face and superior part of the body, while the other parts remain dry and hot.

Occasionally, the patient will sweat, during a part of the twenty-four hours, almost from the beginning of the fever.

In fatal cases, there sometimes appears, what has been called the *washer-woman's sweat*, which is extremely profuse over the whole surface of the body and extremities, standing in large drops on the face, and giving to the cuticle, on the palms of the hands and soles of the feet, a corrugated appearance and a light colour, as if it had been long macerated in water. In such cases, the perspiration is warm till a short time before the patient expires. I have never seen an instance of recovery after this kind of sweating.

After the fever begins to decline, the perspiration becomes universal, especially while the patient sleeps; in this case it is not very profuse and produces a cooling and not unpleasant effect.

The skin has a peculiarly dirty appearance, and feels harsh and dry except when covered with perspiration. In some instances the surface of the patient's body communicates to the touch a sense of scalding, or a certain kind of pungency, which it is difficult to describe, but, when we are accustomed to it, readily distinguished from the sensation given in any other fever, which would perhaps equally affect the thermometer.

In the advanced stage, it is not uncommon for biles to appear; if they have a bright red colour and proceed

to suppuration, it is a favorable symptom. Sometimes there appear eruptions about the mouth; these are considered by most physicians as a good indication, and I think I have generally found them so.

There is a remarkable odour arising from a person affected by this disease, so peculiar that I feel assured that upon entering a room, blindfolded, where a person had been confined for some length of time, I should be able to distinguish it from all other febrile affections.—This is an additional circumstance in favour of the existence of the specific cause assigned above; as several other diseases which arise from contagion are attended by an odour peculiar to each, which, when once fixed in the mind, enables a person to recognise their presence ever after. This is strongly evinced in small-pox, measles, malignant sore throat, &c.

The absorbent system is perhaps less affected than any other, and, in consequence, emaciation takes place rapidly. This is rather a good symptom, for I have observed that patients who emaciate rapidly are more likely to recover, than when they retain their ordinary degree of fatness, or when the face appears full and bloated. This last symptom, occurring after the disease has existed some days, indicates great danger.

In some instances, the power of absorption in one of the lower extremities is in a degree lost, and one leg and thigh become enlarged. As the fever abates, the cellular substance appears to be loaded, the muscular power is weakened, and the limb feels heavy and unwieldly.

In some cases, it is eventually restored, in others, the enlargement continues through life.

After the fever has subsided entirely, and the appetite is perfectly restored, the patient generally gains flesh very fast, and often acquires a greater size and weight than he possessed before the attack.

This increase in size takes place much earlier and more rapidly than the acquirement of muscular strength.

In cases where the disease has been very severe, and the patient has recovered, the hair comes off from the head, and is succeeded by a new growth; this happens more frequently with those who have much and long hair. The new hair, however, never acquires so great a length as the old.

After a very severe attack, the cuticle peels off from the palms of the hands and soles of the feet, and sometimes from the whole surface of the body; as is perceived when the skin is rubbed by the hand, when in a state of perspiration.

The cuticle never separates in this way till the diseased action diminishes and the patient begins to recover.

As respects critical days, much has been said and written from the earliest physicians to the present time; for my own part, I have never been able to determine that any exist, and if they do, they can be of no use, in a practical point of view, for two reasons; first, the disease attacks in such a gradual manner that we hardly know on what day to fix its commencement; and second, when it terminates favourably, it often happens that the patient remains a week or more in such a situation that the practitioner is unable to decide whether he is mending or failing.

Treatment of Typhus.

If the pathology of Typhous Fever which we have just laid down, be correct,—if it arise from a specific cause and has a natural termination, it may be a question, how far we are to attempt a cure of it, or if we possess the power, whether we can with propriety cut it off in its commencement, and by art prevent its running its course.

Physicians in this country are divided in opinion on this subject. Some imagine that they have often cured it immediately after its first attack, nipped it in the bud, as they say, while others of perhaps more experience will tell you they are not certain that they have ever arrested this disease by medicine.

I confess the subject is a difficult one, and that it is next to impossible to demonstrate the truth of either the positive, or negative side of the question, and as absolutely so to those who have already made up their opinions on the subject, as to that still larger class, who have yet to learn to doubt their own skill and mistrust the powers of medicine.

When a person is taken unwell, has a pain in the head, takes medicine, and the next day recovers, if the attending physician is disposed to consider it a case of Typhous Fever, we can bring no testimony to prove that he would not have had the disease, had he not taken the remedy.

In such cases we can only make the truth probable, and what appears so to one, may not to another.

In the first place, Typhus in its commencement exhibits so many symptoms in common with other febrile affections, that it is not easy for any one, especially the

unexperienced, to determine whether the disease is truly Typhus or not; even those, who hold to the opinion that they often cure it suddenly, have confessed to me that they cannot distinguish it from other febrile affections upon its first attack, and never positively, till the disease has, in a considerable degree, developed itself.

This confession is alone sufficient to render the correctness of their previous opinion doubtful.

Again, these very physicians, or at least a portion of them, have acknowledged that when the disease is fully formed, that is, when the patient has the Typhous Fever, it cannot with any certainty be interrupted or cut off, as they express it.

Besides, we have to oppose to the opinions of those, who think they often cure this disease in its commencement, the belief of others of quite as much experience, who think they have never interrupted its course in a single instance.

Indeed, I am myself of this latter opinion, for during the whole course of my practice I have never been satisfied that I have cut short a single case of Typhus, that I knew to be such; nor have I seen a solitary instance of its having terminated within fourteen days from its first attack.*

* This assertion of the author has been objected to by journalists who have reviewed the first edition of this work, as inconsistent with some of his own statements. They remark that the author himself subsequently speaks of having interrupted the disease by the aspersion of cold water. He does, it is true, speak of sudden and surprising amendment resulting from the judicious employment of this remedy; but let it be carefully observed that this is stated to have occurred in cases of protracted continuance, in which the character of the disease is entirely changed, the fever being connected with the sequelæ of Typhus. N. R. S.

Cases have occurred to me often where the distress and sufferings of a patient have been alleviated in less than half that time; but the morbid action has not ceased, nor the healthy one of the secreting surfaces been established, and a natural appetite restored, within the time above-mentioned.

It does not follow, because we have no expectation of arresting the disease, that we are to neglect doing any thing. In cases of the other contagious diseases, which are destined to run a certain course, as the small-pox, we often prescribe early in the disease, and with evident good effect, but not with a view to stop, or cut off the disorder; for whatever we do, we expect it will pass through all its regular stages, and our prescriptions are calculated only to render it milder and safer, and enable the patient to live through it.

With the same views, I prescribe for Typhus, both at its commencement, and through the course of the disease; for Typhus has a natural termination like other diseases which arise from specific causes.

On the other hand, it does not follow of course, that this disease in all cases requires remedies, or that a patient should necessarily take medicines because he has the disease. In other specific diseases, we proceed on the principle of withholding our remedies unless they are called for by particular circumstances, and thus many cases of measels, hooping-cough, and other contagious diseases, go through their course to their natural termination without medicine.

In cases where the disease is going on regularly in its course, without any symptom denoting danger, and without any local distress, it is presumable that medi-

cines, especially powerful ones, would be more likely to do harm than good. Although Typhous Fever is a more formidable disease than measels or hooping-cough, yet there are many mild cases, and in such cases, I apprehend that the use of powerful means, with a view of curing the disease, is liable to do great mischief.

I have seen many cases, in which persons in the early stages of this disease were moping about, not very sick, but far from being well, and who, upon taking a dose of tartrite of antimony, with the intention of breaking up the disease, have been immediately confined to their beds.

In fact, I feel well convinced, that all powerful remedies or measures, adopted in the early stage of Typhous Fever are very liable to do harm, and that those patients, who are treated with them in the beginning, do not hold out so well in the latter stages of the disease.*

If it is determined that something must be done at or about the commencement of the disease, the question is, what that something shall be, and the first thing usually suggested is blood-letting.

* Happening in company with a physician with whom I was slightly acquainted, he observed that he had adopted a new method of treating Typhus, which I was aware had been prevalent in the vicinity where he lived, and stated that it had proved very successful. Upon my inquiring into his peculiar mode of treatment, he informed me that it consisted in giving his patient milk and water, and nothing else, through the whole course of the disease, and he affirmed that he had treated quite a number of patients, and had not lost a single one since he had adopted this mode of treatment.

I take this to be a confirmation of my opinion, that powerful remedies are not properly used in this disease, unless called for by particular circumstances, and that these circumstances are more rare than is generally supposed.

From the time Dr. Cullen published his "First lines of the theory and practice of Physick," till very lately, students were generally taught to believe, that Typhous Fever was produced by some weakening power, and was, in effect, a disease of debility.

Dr. John Brown enlarged upon this theory, and inculcated a notion in accordance with it, that it should be treated by the most powerful stimulants. He considered bleeding and all other modes of depletion as highly reprehensible, because Typhus was placed at the lower end of his scale of diseases, that is, below the standard of health.

This theory was carried into practice by many, and those, who might not have been converts to Brown's peculiar doctrines, not having sagacity enough to perceive that this debility was the same thing as specific disease, were nevertheless cautious about bleeding in a fever, which they considered Typhus, or possessing what they called a Typhus type. The most approved English authors since Cullen have held this doctrine till within a few years.

Very lately several writers* have ventured to recommend bleeding in this disease.

Some of them have advised this practice in certain cases, where there appeared to be more than an ordinary degree of excitement in some particular organ, in the brain or lungs for example, while others have recommended it, simply because the disease was Typhus, without waiting for any particular symptom, or set of symptoms to indicate its necessity.

* Armstrong, Pritchard, &c. &c.

The practitioners of medicine in New-England, have been divided on this subject; and while one part have become converts to the doctrine of blood-letting to a high degree in this affection, the other has condemned it *in toto*, and, as though opposition had produced a kind of re-action on their part, they have had recourse to the most powerful stimulants both internally and externally, such as opium, wine, alcohol, and the most acrid stimulants, as cayenne pepper, arsenic, &c. Indeed, individuals of this latter class have carried their prejudices to such an extent, as even to boast of having made their patients swallow three pints of strong brandy, accompanied with large doses of laudanum and cantharides.

I have myself seen a written prescription, in which opium, wine, alcohol, cantharides and arsenic, were all directed to be taken several times in the course of twenty-four hours.

It is remarkable, that though the practice of these two sects, for such they seem to be, is as opposite as possible, each considering the other's mode of treatment as highly deleterious, yet all boast of success and enumerate various cases, which have fallen under their care, with scarcely the loss of a single patient; yet, notwithstanding these two highly improved modes of treatment, it is a notorious fact, that Typhous Fever often proves fatal.

There are but two ways of accounting for the equal success of these two opposite modes of cure, for as far as I can judge there is not much difference in the success which attends them. Either the disease is not so much under the control of blood-letting as they would have us believe, or these two extremes produce about

an equal degree of mischief; for it is not conceded, that, if a patient does not require bleeding, he stands in need of opium, arsenic, cantharides, or alcohol.

It has been observed that in certain cases of Typhus, there is great pain accompanied with a sense of fullness in the head, and in other cases, the patient complains of severe suffering in the chest, which is increased by a full inspiration.

Under these circumstances, the loss of blood, to the amount of from twelve to sixteen ounces, often mitigates these troublesome symptoms, and probably may not only alleviate the patient's suffering, but may enable him to go through the disease with more safety.

So far as I can judge from my own experience, bleeding does not generally produce any considerable change in this disease; the pulse is not rendered slower by it, and after the faintness, if there is any produced by the operation, disappears, the heat is not perceptibly diminished.

In some cases, in which I have resorted to this expedient, I feel confident that the pulse became more frequent and the temperature of the body higher in consequence of the loss of a pound of blood.

As hæmorrhage sometimes makes its appearance in Typhous Fever, and generally at about the height of the disease; the advocates for indiscriminate bleeding have imagined that taking blood early in the disease will prevent its occurrence. Upon this subject little need be said, since it is next to impossible to disprove the assertion; for my own part, I have never seen any evidence of its truth.

In the autumn of 1812, Professor Perkins, now of

New-York, and myself, attended between fifty and sixty cases of Typhus in the vicinity of Dartmouth College, and many of them students of that institution.

Of the whole number, which came under our care, one only was bled, and that on account of a sense of fulness in the head, of which he complained.

This patient had afterwards a hæmorrhage from the bowels, which was pretty profuse, but he eventually recovered.

This symptom did not occur in any other of our patients, of whom we lost but one.

I am sensible that it is not safe to rely on one fact alone in making up an opinion on a practical subject. This case is mentioned only to show that bleeding does not always prevent hæmorrhage; and from the success of our practice, it would seem that blood-letting is not so essential, as some would persuade us to believe.

That patients often recover from this disease after blood-letting has been practised is an unquestionable fact, and the inference which should perhaps be drawn from it, in conjunction with the facts mentioned above, is, that the loss of a moderate quantity of blood in Typhus, is not of itself dangerous, and in a majority of cases, may be allowed with impunity. There are cases however in which it may be essential to the patient's safety, while in others it may prove highly injurious. The judgment and skill of the physician is necessary in each individual case to determine the propriety of its adoption, as well as the quantity which should be abstracted.

I have never seen any benefit from blood-letting in Typhous Fever, where there was no local inflammation or congestion, that particularly called for it.

The symptoms, which would induce me to bleed, are uncommon pain in the head, accompanied with great heat in that part, a sense of fulness, and a throbbing of the temporal arteries; or marks of congestion in the viscera of the thorax, such as pain in one or both sides of the chest, increased by a full inspiration.

The state of the pulse also should be considered before we bleed; a very frequent one does not indicate blood-letting, on the contrary, in such cases I have seldom or ever seen this evacuation attended with advantage.

Many of the French physicians prescribe leeches instead of general bleeding, and where they can be procured, the remedy may be tried with safety, as there is less to be apprehended from the loss of an equal quantity of blood by leeches than in any other way.

The blood, drawn in Typhus, seldom shows a buffy coat, and as far as I can judge, is found rather darker coloured than in ordinary cases of active inflammation.

Emetics and evacuants from the stomach and bowels are generally prescribed after the question of the propriety of blood-letting has been decided.

From what has been said on the subject of attempting to interrupt or arrest Typhous Fever, it will be readily understood, that I do not deem it necessary in every case to give either emetics or cathartics; but as these remedies are often necessary, it is important that we should point out, if possible, the circumstances which demand their use.

In cases of simple, mild Typhus, where there is no nausea at the stomach, no pain in that region, where the heat is moderate, and the pulse not greatly altered

in frequency, I am clearly of opinion that we had better leave the disease to cure itself, as remedies, especially powerful ones, are more likely to do harm than good. In such cases, the patient gets along better without medicine than with; all that is required is to give him simple diluent drinks, a very small quantity of farinaceous food, and avoid as much as possible all causes of irritation.

The symptoms, which require the use of emetics, are nausea, sickness and oppression at the stomach; and when required, it may be an important question what kind of emetic should be given.

The tartrite of antimony is an old remedy in the commencement of fevers, and when active inflammation exists, there is no one with which we are acquainted, that possesses so powerful an effect in suppressing it.

As some consider Typhous Fever a local inflammation, or an affection of the circulatory system dependant upon it, preparations of antimony would not seem inappropriate remedies. I will not take upon me to say that this fever is never connected with local inflammation, but if so, it is not with that kind which we generally denominate phlegmonic, or that which tends to suppuration, nor that which has been called sthenic, as is conclusively proved by the effects produced upon it by blood-letting, since this evacuation possesses a controlling influence over the one, while it has but a slight power over the other. Though it may in certain cases obviate some of the troublesome symptoms of Typhus, and perhaps render the disease safer, yet it does not cure it, and in many cases is highly improper.

So likewise, as far as I have been able to judge, tartar

emetic should not be used in this affection, even at its commencement; and in the later stages of the disease, it is sometimes followed by fatal consequences.

From the bad effects, which I have seen result from the use of antimony in this complaint, I have long since neglected it in my practice, and have substituted for it the ipecacuan, eupatorium, or the sulphate of zinc.

The use of this class of medicines has generally been confined to the commencement of the disease, but they are frequently proper and useful in its later stages.—The articles, which I have just mentioned, either simple or combined, may be given, with safety and often with advantage, at any period when the symptoms are such as to demand an emetic.*

Cathartics are recommended in almost all febrile diseases, and in many cases, much dependance is deservedly placed upon them; their general use, however, should not be indiscriminately recommended. In this, as in similar cases, we should consider the necessity of their administration, and whether they would probably produce the desired effect, not neglecting the particular

* The author has, perhaps, not been sufficiently particular in regard to these circumstances which indicate the employment of gentle emetics. In the onset of the disease, they are useful, as given by Dr. Armstrong, for the purpose of favoring re-action, determining to the surface, assisting to unload the heart, great vessels, and viscera, and equalizing the circulation.

In the after progress of Typhus they are salutary for the purpose of removing those acrid secretions which irritate the stomach and re-act on the disease. Irritability of the stomach, and the occasional discharge of morbid secretions are the symptoms which then point out their use.

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means to be employed, and the extent to which we consider ourselves justifiable in carrying those means.

There are no remedies capable of doing much good, which under certain circumstances and in certain doses may not do harm, and I am persuaded that powerful ones of this class are always injurious.

Costiveness often occurs in the commencement of this disease. This kind of costiveness, is however, of a very different character from that which is habitual with some individuals, and which we so often meet with in stomach and bowel complaints, where the stools are unfrequent and the fæces hard and indurated.

The stools in this disease, except at its commencement, when there is generally an accumulation in the great intestines, are always liquid and possess a peculiar colour and odour.

The costiveness, therefore, consists only in the unfrequency of the discharges, and not in their consistence.

If a strong drastic cathartic be administered, it is often followed by a diarrhœa, which, though not always injurious when moderate, is always liable to become so.

I have never known a patient die of Typhus whose bowels were slow and required laxatives to move them, during the course of the disease. Laxatives, therefore, and not purges are required in this affection; and the milder they are, if they have the effect to excite the bowels to throw off their contents, the better, and even these should not be used too freely. If the bowels are shut up too long, their contents become offensive to the intestines, stimulate them violently, and a diarrhœa is more likely to follow, than if the bowels had been excited by a gentle laxative.

Laying aside the strong purgative drugs, we have a considerable number of mild cathartic ones to select from; epsom salts with senna, rhubarb, alone or with a very small quantity of calomel or ipecacuan, given in small and repeated doses, are amongst the best articles of this kind.*

Blisters have long been employed in fevers under the general impression that they were useful, without any very definite notion of the mode by which they produce a good effect, and without waiting for any particular symptoms indicating their use.

So far as my experience extends, they do not produce any very considerable influence on the disease; like bleeding, they will sometimes relieve local pains, when applied near the part effected, as on the forehead or back of the neck when there is pain in the head—on the breast, when the chest is affected.

In most cases if they do no good, they produce no bad effect; but when there are petechiæ, or a disposition to hæmorrhage, indicating great debility in the system of capillary vessels, they are liable to do harm, for in such cases, the blistered surface often becomes black and gangrenous.

Upon the whole, we cannot consider blisters as pos-

* In regard to the employment of cathartics, we are to be governed in a great degree by the aspect of the stools. If they are dark, acrid, and offensive, gentle purgatives ought generally to be repeated till their character is changed. Tenesmus and tumidity of the belly also indicate their necessity. Calomel or the blue pill should be occasionally associated with them.

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sessing much influence in Typhous Fever, and they may in most cases be dispensed with.*

With regard to the perspiration, there can be no doubt, but that a great quantity of aqueous fluid escapes from the body in the form of vapour in Typhous Fever; but it does not become so condensed, during the hot stage, as to show itself in the form of a liquid on the skin, till there is some abatement of heat on the surface.

As there is more or less of sweating in the decline of most febrile diseases, and as a general perspiration is often accompanied with other symptoms of amendment, it has been looked upon as the natural cure of the disease. Under this impression, it has been a pretty universal practice to encourage sweating; but with respect to the grounds upon which this practice is founded, it is a question, whether the effect has not, in this case, been mistaken for the cause; that is, whether the sweating is not the effect of the amendment, rather than the cause of it; and if so, it is still more questionable, whether sweating, produced by art in the beginning of the disease, would be attended with good effects.

In all cases, where I have seen this sweating regimen adopted, especially when much external heat has been applied, the practice has been obviously injurious.

* When great inequality of excitement exists—the extremities cold and insensible, while other parts may perhaps be morbidly hot—when, too, the blood and nervous energy are concentrated in the deep organs, and the surface is lifeless and pallid, blisters to the extremities and over the congested organs are of great value.

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There are some medicines in the class of diaphoretics, which may be given with impunity, such as the ipecacuan, contrayerva, and the Virginia and Seneca snake roots, though they seldom or ever produce any sensible perspiration till the disease has formed a crisis, and then the patient will perspire freely without their assistance. When stimulating remedies are given internally and heat applied externally, to force a sweat, as it is called, the consequences are always bad at any period of the disease.

Opium in some form or other is often used in Typhus, and in many instances and under certain circumstances, may be useful, but is by no means an universal remedy, nor can it be administered with impunity in every stage of the disease.

When the patient is hot and suffers from pain in the head, and throbbing of the temporal arteries accompanied with confusion of mind, opium is generally hurtful, and seems to augment rather than diminish these troublesome symptoms. But after their violence is in some degree abated, and the heat has become moderate, it may be used, and when combined with ipecacuan, sometimes gives rest and quietness during the night; although in many cases it will have the opposite effect; and serve to make the patient more watchful and restless. Under such circumstances, if persisted in, it does harm.

When diarrhœa occurs, opium combined with ipecacuan and camphor, is generally useful; and if it does not succeed in checking the discharge, does not appear to produce an injurious effect.

The use of this drug has also been advised in cases

of great prostration of strength, that is, in cases where the morbid action is kept up in kind, but has abated in force, owing to the exhaustion of the sensibility and irritability of the capillaries. In cases of this description it has been prescribed as a stimulus to support the patient, and in such instances it must be acknowledged, that it is sometimes used with apparent advantage.—But under the same circumstances, it does not always agree with the patient; and sometimes instead of quieting and giving him ease, produces a contrary effect, rendering him restless and watchful, and not unfrequently brings on or increases delirium, especially if given in large doses.

Upon the whole, opium may be used to advantage under certain circumstances in Typhous Fever, but cannot be considered as a specific in any stage, and is at best but a doubtful remedy.

A few years since mercury was, by many physicians in this country, considered a specific in Typhus, and its influence over the disease explained upon the principle that two kinds of morbid action could not exist in the system at one and the same time, and it was supposed that giving mercury so as to excite its specific action on the mouth, was substituting the mercurial disease, which was of short duration and safe, for the more dangerous febrile disease called Typhus. This ingenious explanation appeared very well in theory; all that seemed necessary was, that the facts should be found corresponding. Had this desirable incident happened, we should have possessed a very easy and safe mode of curing this somewhat intractable disease, by simply putting our patient under a regular course of mercurial

remedies, so as to affect his mouth for a reasonable length of time. But unfortunately, we have as yet discovered no such sure and easy method of curing Typhous Fever.

It was always acknowledged by the advocates for this practice, that in some and very severe cases, and those in which medical aid was most necessary, the mercury would not have its usual effect, and ptyalism could not be produced, and it was further confessed that in such cases if the mercury was pushed to any considerable extent, it produced a very bad state of the mouth, occasionally terminating in gangrene of the gums.

I have had several cases of necrosis of the under jaw, where I was compelled to remove a considerable portion of that bone, which had died evidently in consequence of an inordinate use of mercury during this fever.

In other cases, where calomel has been used early in the disease, and the mouth has been as favorably affected as could be wished, the disease nevertheless has run on forty or fifty days, and sometimes terminated fatally at a very advanced period. In some instances, after the mercury had affected the mouth, there has been a copious discharge of tough, ropy mucus from this part, which has been kept up for a long time after the other specific effects of the remedy had ceased.

This vitiated discharge of saliva is often accompanied with a vitiated secretion of the gastric fluid, and attended with a total want of appetite, and a constant ejection of every thing taken into the stomach.

Such patients have frequently recovered with diffi-

culty, eight or ten weeks after the commencement of the disease. I have been consulted in many cases of this description.

Mercury, therefore, cannot be considered a specific in Typhus, but may be an useful auxiliary in certain cases, that is, the blue pill or a small portion of calomel, combined with some other medicine, may be used with advantage. A small quantity of calomel with opium has in some cases checked a colliquative diarrhœa; and a grain of the same, joined to five or six of rhubarb, has done very well as a laxative.

Those physicians who consider Typhus as a disease arising from debility, have highly extolled the virtues of the Peruvian bark, and some have employed it through the whole course of the disease, while others have restricted its use to its later stage.

It is not from ingenious reasoning or fine spun theories, that we should estimate the value of a remedy, but from the effects actually produced by it in the majority of cases. Judging in this way, this remedy cannot be allowed a very high place, since as was before observed, the physicians just mentioned, who treat this disease with tonics and stimulants, have not been remarkable for their success.

I have prescribed the cinchona in many cases, and as far as I am able to judge, when there was a considerable heat present and while the mouth was inclined to be parched and dry, and especially when there was pain in the head, its use was injurious. But in some cases, when there was a sense of coldness creeping over the patient, and where there was hæmorrhage, it produced a good effect.

Upon the whole, the bark like mercury may be an auxiliary but cannot be considered an important remedy, much less a specific.

Bitter infusions may be used through the whole course of the disease, such as the eupatorium, (perfoliatum,) chamomile, and various others. When taken in considerable quantities, though they do not cure the disease, they may assist in preserving the tone of the stomach in some degree, and in that way aid in conducting it to a favourable termination.

Some twenty-five years since, the alkalies were proposed as remedies in febrile diseases, and for a time were considerably used.

They were introduced on the supposition that they possessed antiseptic properties, but they have not fulfiled the expectations of those who introduced them, nevertheless, I have occasionally seen them produce a good effect. Fever does not prevent the fluids from becoming acid in the stomach, and where this happens, the moderate use of the carbonate of soda or of potash removes the irriation and burning sensation in the stomach caused by the acid; and thus far they may serve as palliatives, but I could never perceive that they possessed any other power over this disease.

The alkaline carbonates given with some acid, so as to evolve carbonic acid gas in the stomach, are generally grateful to the patient, and perhaps sometimes useful.

Those physicians, who adopted the notion that alkalies were antiseptic, of course considered acids as septic, and proscribed their use; and there were not wanting instances of their disagreeing with the stomach, especially the vegetable acids.

We have already mentioned, that fever did not prevent the fluids from becoming acid in the stomach, and I have, in several cases, witnessed a sensation of burning accompanied with an indescribable feeling of distress in that organ, coming on after taking lemonade and other vegetable acids; but such cases are rare. In most instances, the vegetable acids, diluted with water, will be found grateful to the patient, and may, in almost all cases, be taken with impunity.

The mineral acids have been used as remedies in Typhous Fever, especially the muriatic and sulphuric. I have oftener prescribed the former than any of the others belonging to this class, and have thought that the moderate use of it aided in preserving the powers of the stomach; but it is not a medicine upon which much dependence can be placed.

We were formerly taught to place some reliance on that class of medicines called refrigerants, viz. the acids and neutral salts. We have already had occasion to mention the acids; their refrigerating power is very trifling. As for the neutral salts, some of them may be used as cathartics in the early stage of the disease, when the heat of the body is considerable. The sulphate of magnesia, and the tartrite of potash are the best; but in the advanced stage of the disease, they sometimes produce an injurious effect on the stomach, and are apt to induce diarrhœa; this is more particularly the case with the sulphate of soda.

Nitre, or the nitrate of potash, was formerly a favourite prescription in fevers of all kinds. When this article is given in very small doses, it produces no perceptible effect, and if given in large, it does a positive injury to the stomach.

All things considered, we can place no dependence on internal refrigerants, and if we wish to produce this effect, that is, if we desire to diminish the temperature of the body, when above the ordinary standard, we must have recourse to cold water, or cold air.

The heat may be lessened by covering the patient lightly, and admitting cool air into the room, when the season of the year will admit of it; or by admitting the air in contact with the skin, by raising the bed-clothes on one side of the bed, and bringing them down suddenly again;* in this way we can cause a current of cool air to pass over the body, which will conduct off the heat and greatly refresh the patient.

But the most effectual method of reducing the temperature of the body is by the use of cold water, which may be taken internally, or applied externally. When persons, sick of this disease, desire cold water to drink, it should never be denied them—they should be allowed to drink *ad libitum.* The quantity of heat abstracted from the body by the water which they will drink, however, is but small, and except in cases where, by its influence on the stomach, it produces perspiration, its effects are very trifling.

The only effectual method of cooling the body, in these cases, is by the use of cold water applied externally; by this means we can lessen the heat to any degree we please. Different physicians have adopted different modes of making the application. Some advise to take a patient out of bed, pour buckets of water upon him, and then to replace him again; while others prefer

* Fanning the patient with the bed-clothes. N. R. S.

sponging him with cold water. We have cases, where cold water would be of service, in which our patients are too much reduced to be taken out of bed and placed in a sitting posture without injury. In these cases a different management will be necessary. The method, which I have adopted, is to turn down the bed-clothes and to dash from a pint to a gallon of cold water on the patient's head, face and body, so as to wet both the bed and body linen thoroughly. It is better that he should lay on a straw bed when this is done, it is not however essential. If his body should be very hot, he may be turned upon his side, and the water dashed upon his back.

As soon as his linen and the bed-clothes begin to dry, and the heat in the head and breast begins to return to the surface, the water should be again applied, and in this way the heat may be kept down to the natural standard or rather below, on the surface, so that the skin may feel rather cool to the hand of a healthy person.

It is not very material what the temperature of the water is, if it is below blood heat, excepting the shock given by its first contact, which in cases where there is much stupor or coma, is of some importance; in general, the effect is produced chiefly by the evaporation.

All additions made to water used for this purpose, such as vinegar, spirits, &c. are injurious. The former, on being evaporated on the surface of the body, covers it with a thin pellicle formed by the sediment, which makes the skin feel stiff and unpleasant; and spirits evaporated about a sick person produce an offensive odour, and likewise leave some impurities on the skin and clothes.

When water is used to wash the body, as is often necessary in this fever, soap, or the carbonate of potash may be added, but when used to reduce the heat alone, pure water will be found best.

When the temperature of the body is such, that it does not require the general application of cold water, still it may be occasionally applied with advantage to the head and face.

Whenever there is any dryness of the lips, teeth or tongue, it may be relieved by letting water, slowly squeezed from a sponge or cloth, fall on the mouth and over the whole face; this should be repeated often enough to keep the mouth clean and moist.

I have produced a good effect by laying a piece of thin, loose muslin over the face, so as to have the air drawn through it in the act of inspiration, at the same time keeping it constantly wet with cold water; in this way, the vapour inhaled into the lungs, proves very grateful to the patient.

I could state many cases in which cold water was applied with the most unequivocal advantage.

In the summer of 1798, the first year in which this fever occurred in my practice, T. B., a young man of about twenty-five years of age, was brought into my neighbourhood sick of Typhus, for which he had been bled before I saw him; the fever was severe, and his unfavourable symptoms increased for several days. In a consultation, it was agreed to put him into a warm bath, which was done.

He was a little delirious before he went into the bath, and when he came out, was raving. From this state, he sunk, in the course of the next night, into a low

muttering delirium, with a great degree of coma and starting of the tendons, and with scarcely the ability to swallow. His pulse was irregular, but still possessed some force, and his heat was above natural. Twenty-four hours were passed in this situation, without any symptoms of amendment. The next day when I visited him, about nine o'clock in the morning, the weather being very warm, (as it was in the month of July,) a young man, who had engaged to attend him that day, came in, bringing a gallon pitcher full of cold water, which he had just drawn. Finding the patient's pulse had some strength and his heat continued above natural, I stripped him naked as he lay on a straw mattrass, and then poured the gallon of water over him from head to foot. He seemed to feel the shock, but did not speak. The young man in attendance was ordered to repeat the affusion as often as he began to grow dry and warm, which was punctually performed.

When I visited him a little after sunset, his heat was diminished, and his pulse did not intermit as often as it had done. He was then taken off the wet bed and laid on a dry one, likewise of straw, with nothing but a linen sheet spread over him. The windows of the chamber were kept open through the night, and a dose of opium and musk was prescribed and taken. No other internal remedies were administered. The next morning there was no alteration. The affusion of cold water was renewed as the day grew warm and the heat was kept down through the day as it had been the preceeding one. Before night, the patient recovered so as to speak, called for more water, and said he wished to be put into the river. From this period he became conva-

lescent, and recovered without the use of any other remedy.

In the month of September, of the year 1800, I visiteded A. P. a strong robust man, aged between thirty and forty years. He had been sick about a fortnight, his head was not much affected, but the heat was great and his thirst urgent. My visit was in the evening.—The body was stripped, that is, the sheet which was thrown over him was removed, and his shirt divided down before so as to expose his body, and about a quart of cold water was applied by sprinkling it on with the hand. The sheet was then thrown over him; and the water applied as often as he became dry and the heat began to return. A little peruvian bark, mixed with some nitrate of potash, was all the medicine taken.—Previous to this he had drank, every night, two quarts of some diluent drink, for several nights in succession. After the first application of the water, that parched sensation of the lips and mouth, which urged him to drink so much, abated, and he lay the whole night without any desire to drink. The next day he was convalescent, and recovered without medicine.

I. B. a strong robust man, aged between thirty and forty, had been sick a fortnight when I first visited him; his pulse was frequent, his heat great, and his mouth exceedingly parched, so much so that he could not sleep but for a very few minutes at a time without being awakened by a sense of thirst. His feet were very cold.

This individual had been badly treated, and his friends had been prevented from changing his linen and bed-clothes by the physician, who had fears that he would take cold!

The patient was first shaved, an operation which had not been performed for something like a fortnight, he was then slipped down in the bed so as to drop his feet into a vessel of warm water and soap, where they were rubbed till they became clean and warm. The bed and body linen were then changed and he was properly placed in bed. The affusion of cold water was commenced over the head and breast, and repeated sufficiently often to keep down the heat. The distressing thirst was removed at once, he became convalescent the next day, and recovered without any further medical treatment.

I could detail a great many additional cases, where the good effects of cold water were as apparent and as immediate as in the cases just cited; and in no instance where I have used it, or seen it used by others, has it done harm. There are cases, however, where its application is not called for; at the same time there are but few in which it may not, in some stage of the disease, do good. It is always grateful when applied to the face and mouth, and its vapour is very salutary and refreshing to persons sick with fever.

It will be observed, that the first time I used cold water externally in fever, was in 1798, the first hint of which I took from Dr. Robert Jackson's work on Fevers of warm climates.

With regard to diet, it is not necessary to say much; if patients were left to select for themselves without the interference of nurses and friends, who are always afraid they will starve, they would generally decide right, since they would not often take any thing, that could be called food. The farinaceous and mucilaginous substances are the only articles of nutriment ad-

missible, with the exception, perhaps, of milk largely diluted with water, or whey prepared from it.

All solid food is injurious, and all sorts of broths prepared from animal substances should be prohibited.

After the fever has formed a crisis, and the secretions of the mouth have become healthy, the appetite generally returns; and if we then allow the patient to choose for himself what he will eat, and take care that the quantity taken at first is very small, he will not often be injured by it. But it is not safe to let patients judge as to the quantity. Their minds are weak, and their appetites strong, and they would, if allowed, often hurt themselves by too much indulgence.

With respect to liquids, I have generally let the patient choose for himself, provided he does not select any of the stimulants, such as ardent spirits or strong beer, which, however, is almost never the case. Cold water, or water acidulated with one of the vegetable acids, small beer or brisk cider, are the drinks which are usually preferred. The infusion of the pleasant aromatic herbs may be always allowed.

Beside giving directions for the use of medicines, it is important that we should direct, what may be called the general management of the patient.

When an individual is first taken sick with Typhous Fever, we should expect a disease of considerable length, and make our arrangements accordingly. If the thing is practicable, he should be kept in a spacious room, the larger the better. His bed should be of straw or husks, especially if it is in the warm season; and it should not be placed in the corner, but brought out into the room. We should contrive to have a current of air pass over the bed by means of doors and

windows. It is well to have a chimney and fire-place in the room, and in the night when the air is very still, (though the weather should be warm,) a small fire kindled with a little dry wood, so as to cause a current of air up chimney, and by that means often to change the atmosphere of the room, will be found of service.—In the warm season of the year, the windows should be kept open night and day. All the furniture should be removed, except such articles as are required for the patient's use. The windows should be darkened, or something opposed to the light, in such a way as to still admit the air. The room should be kept as quiet as possible, since noise is injurious, and no more persons should be admitted than are necessary to take care of the patient, which will, if he is very sick, require the labour of more than one.

The room should not be carpeted, and the floor should be often washed with pure water, or soap and water, and in the hot season, it, as well as the walls, may be kept wet with water during the heat of the day.

Cleanliness is absolutely essential to the patient's comfort, and no dirty dishes or useless medicines or food should be suffered to remain in the room. All excrementitious matters should be removed immediately. In the warm season of the year, the bed and body linen should be changed every day, and in the cold, every other day at farthest.

The patient's body and limbs should be cleansed every day with a piece of sponge and warm water, or soap and water. If a male, he should be shaved every day, or every alternate day, and if a female with long thick hair, it should be cut off or thinned, so as to leave but little of it the full length.

OBSERVATIONS

ON THE

PATHOLOGY AND TREATMENT

OF

NECROSIS.

The etymological definition of Necrosis is, the *death* of some part of the bony structure. As technically employed in medicine and surgery, however, it designates a particular form of disease, characterized by peculiar symptoms, and often, generally indeed, terminating in the death of a portion of the bone in which it is located. We may perhaps question the propriety of the above appellation, if it be made to appear, as I shall attempt, that the death of the part affected is not the *necessary* sequel of the disease, although the most frequent. It is the same inconsistency of language that obtains in the application of the term hydrocephalus to those inflammatory affections of the meninges of the brain, which sometimes terminate in dropsy of that organ.

This disease was formerly known in New England under the name of *fever-sore*, given to it, undoubtedly, because it is generally accompanied, from the very com-

mencement, with a high degree of constitutional irritation and symptomatic fever. The constitutional disturbance, in most cases, being nearly synchronous with the local affection, induced medical men, while the humoral pathology prevailed, to regard the general disease as a fever, and the local affection as nature's remedy, by which she eliminated the peccant humours.—They probably would have explained it in the following manner:—The fever, to expel the morbific matter from the system, throws it on the part affected, which causes the inflammation and subsequent collection of matter.

The following pathological history of this disease has been the result of extensive observation, the disease very frequently occurring within the sphere of my practice.

Necrosis commences with an acute inflammation, either in the bone itself or its investing membrane, accompanied with an acute pain, not always at first in the part affected, but often felt most severely in the joint nearest the disease. In a day or two, however, it generally leaves the joint, and permanently locates itself in the part inflamed.

Almost from the first commencement of the pain, there occurs severe symptomatic fever of the inflammatory character. The local affection generally terminates in suppuration, frequently as soon as the fourth or fifth day, and this event, if it occur, is rarely protracted beyond the tenth or twelfth. The matter is at first deposited between the external periosteum and the bone. When the shafts of the long bones are the seats of disease, about the same time that matter is deposited beneath the external periosteum, there is formed a cor-

responding collection between the internal surface of the bone and the membrane surrounding the medullary substance, so that there then exist two collections of matter bathing the opposite sides of the walls of the bone. This fact, which I deem of great importance, as being essential to the correct treatment of the disease, I have ascertained in repeated instances, by the operation which I have performed for its relief, namely, the trepanning of the bone.

Very soon after the attack, the whole limb swells, but there is no marked tumefaction immediately in the part affected, till after the matter makes its escape from the periosteum, and is diffused beneath the adjacent soft parts. Whenever this occurs, the extreme pain and symptomatic fever, which till then have continued unabated, in some degree subside, but do not entirely leave the patient.

When this kind of inflammation attacks the spongy bones, the matter is at first collected on both sides of the external lamella, or plate of compact bone, which covers the cells, so that it is similar to the same disease in the long bones, except that in the latter the matter within the bone is lodged between the medullary substance and the walls of the bone, the medullary substance not being affected nor penetrated by the matter.

The death of a portion of bone, in this disease, does not appear to arise from any extraordinary malignity in the inflammation, nor from its exerting any peculiar lethiferous influence upon the part affected, as some specific diseases destroy the parts which they attack.—Abundant cause for the death of the part is found in the insulation of the bone, effected by the accumulation of

matter on both sides of its parietes, and the consequent destruction of those vessels which, from the two periostea, furnish it with blood and nutrition, so that the denuded portion receives no vessels but those extremely attenuated ones, which permeate it from the surrounding margin of healthy bone. These last being insufficient for its nutrition, it consequently perishes. Nature then sets up a process of ulceration for the separation of the dead portion, and the evacuation of the matter contained within it, this occupying a greater or a less time, as influenced by circumstances. The dead and insulated bone, from its indestructible nature, remains as a foreign body in the living parts, until, by the recuperative efforts of nature, it is dislodged entire and rejected from the system; or, being constantly bathed in the secretions which protect the surrounding parts from its contact, is gradually dissolved and wasted away; or, finally, is removed by art.

When the disease has arrived at that period at which the matter accumulated beneath the periosteum has made its way to the surface, and that contained within the cavity of the bone has issued through a fissure in the same, relieving the parts from the irritation of distension and pressure, the symptomatic fever in a great degree ceases. If, however, the collection has been large, and the portion of necrosed bone be considerable, hectic fever is liable to supervene, indicating the continuance, though a change of irritation.

Whenever there occurs a favourable respite, the conservative powers of nature, always active so long as vitality remains, rally for the purpose of remedying the injury inflicted upon the bone. The process instituted

for this purpose varies according to circumstances.—When the portion of dead bone is small and situated on the side of one of the long bones, granulations will shoot from the surface of the sound or living bone, and as occurs in mortification of the soft parts, will push the dead bone off from the living, and finally urge it through the opening previously formed, and disengage it from the body. This is more likely to happen when the soft parts have been divided, early in the disease, over the whole length of the dead portion of the bone.

But in those cases in which a large portion of the circumference of the bone is affected, and especially when the life of the whole circumference, to some extent, has been distroyed, there is formed a bony structure, which attaches itself to the healthy bone, near, or at the part where it has separated from the sequestra or dead portion, around which it forms a bony case, complete, excepting the apertures through which matter flows, and which must thus remain open. The new cylinder of bone does not closely embrace the dead; hence, and also because it overlaps the ends of the living bone, it is to the feel considerably larger than the bone of the sound limb.

Necrosis is almost exclusively confined to young subjects. I have very rarely seen it in persons under five, or over twenty-two. I have, indeed, witnessed a disease in old men which might perhaps be denominated necrosis, as terminating in death of the bone, but characterized by very different symptoms. Three cases have fallen under my observation, in each of which the upper part of the femur was the part affected. Two of the patients were over seventy, the other much younger,

but with a broken constitution, having some years before lost the prepuce and glans penis by a gangrenous inflammation. The disease attacked with considerable pain and constitutional affection; there was, however, for some days, no swelling nor appearance of inflammation externally; but at length the limb became tumid, and a fluctuation was perceived. On opening the part, a considerable quantity of dark and very offensive sanies was discharged; the bone appeared denuded of its periosteum, and of a dark colour. These cases all proved fatal in a short time. In one, the affected portion of bone was separated before the patient died.

In regard to the locality of necrosis, although, perhaps, every portion of the bony fabric is liable to its attacks, yet it occurs in some bones much more frequent than in others.

I have never seen it in the scapula, sternum, nor spine. It very rarely occurs in the bones of the carpus, although I have occasionally seen it attack the fingers. The bones of the cranium are not exempt from it, and it often attacks the lower jaw, the clavicle, and the ribs, but especially the long bones of the arm, fore-arm, thigh and leg. I have seen it in the femur, patella, both bones of the leg, os calcis, metatarsal bones and the bones of the great toe.

My own experience would determine the tibia to be the most frequent seat of the disease; next to this, the femur, and then the humerus.

I am induced to believe, that this kind of inflammation never attacks the articulations in the first instance, but, in the long bones, is confined to their shafts, and when it attacks the spongy bones, as the os calcis, it

does not commence in the articular surfaces, nor within the capsular ligaments. The joints are, indeed, sometimes affected by this disease, but, when this does occur, it is the result of disease extended from the shaft of the bone. The margin of the sequestra is often accurately defined by the line of junction between the shaft and epiphysis of the bone, the articular portion being thus left untouched. It sometimes happens, however, that when the attack is in one of the larger bones of the limbs, and near to the apparatus of the joint, the inflammation extends to the latter, matter is formed within the capsular ligament, and the limb is lost. Such cases, however, are exceedingly rare; in the whole course of my practice I have had occasion to amputate but two limbs, for the purpose of rescuing the patient from this formidable variety of the disease.

Necrosis is not always confined, in an individual case, to one bone, but may occur simultaneously in remote parts, or, which is more common, successively. The secondary attack is not so often on a bone of the same limb as on one of another. When the first attack has occurred in the femur, the second has located itself in the humerus, and vice versa. In a few instances, however, I have observed it in a bone of the same member, attacking, for instance, the femur and the tibia successively. In a few instances it has attacked secondarily the same bone in the opposite limb. I once saw a patient who had had, in the course of a few years, an attack of this disease in almost every bone in his body.

In regard to the general prognosis of the disease, I have observed that a very great majority of patients survive its attack, though often with long confinement,

protracted suffering, and great emaciation. In a few cases, however, the disease proves fatal, and when it does so, it frequently happens at an early period of its progress, and life is destroyed by the extreme degree of constitutional irritation and symptomatic fever. These fatal symptoms are especially apt to occur when the disease occupies a considerable portion of a large bone.—This severity of the constitutional symptoms probably depends on the peculiar structure and sensibility of the part particularly affected. The periosteum, beneath which the matter first accumulates, being a fibrous membrane, possesses, indeed, but very little sensibility in health, but when inflamed, especially when put upon the stretch by distension, it is known to be the seat of the keenest sensations, and to be a source of extreme general irritation, giving a greater shock to the nervous system, than almost any other diseased structure.

In some cases, in which the disease has destroyed the vitality of a large portion of one of the long bones, and in which there must necessarily have occured extensive suppuration and copious discharge of pus, the patient, as in similar results of other diseases, has died of exhaustation.

The patient, also, after having survived one or two severe attacks, sometimes is cut off by the accession of another, and when this is the case, death generally occurs in the stage of excitement and constitutional disturbance.

Diagnostic Symptoms of Necrosis.—It is impossible, even by the most vivid description, to express the character of this disease with the precision with which the observation of a few cases will convey it; and yet, before

one can observe with accuracy or profit, he must know something of its history.

At the disease is an acute inflammation, characterized by the peculiar vital properties of the parts affected, many of the symptoms must be analogous to those of other inflammatory affections. I have often known it to be mistaken, and for a considerable time treated, for acute rheumatism, even although suppuration may have been observed.

In my pathological observations on the disease in question, I stated that it commenced with acute pain in, or *near*, the part affected. It frequently happens that, when the disease fixes on one of the long bones and near its extremity, the pain is complained of in the adjacent joint; thus, when the disease attacks the lower portion of the tibia, the pain is for a time chiefly felt in the ankle. If in the upper part of the tibia, or lower part of the femur, it is referred to the knee joint. It is not long, however, confined to the joint, but fixes itself in the inflamed part. It is this circumstance of pain, referred to the joint, that often causes the disease to be denominated rheumatism.

The pain experienced in necrosis is extremely acute, unremitting, and not much influenced by the motions nor position of the limb. The pain is often a day or two antecedent to the swelling, and when the latter first occurs, it is generally diffused over a considerable part of the limb, especially below the part affected.—The surface is rather firm to the touch, but the skin is not discoloured till after matter is formed and advanced towards the surface. The symptomatic fever is coeval with the pain, they both usually occuring on the same

day. The pulse is both frequent and quick, the stroke sudden, and the artery small and hard to the touch. At first the patient has occasional chills, but when he complains of a sensation of cold, the skin, to another person, feels hot. The pain is so tormenting, that he gets but little or no sleep, during the night is often delirious, though during the day rational. The tongue is furred with a soft, white coat. The face is not flushed, but rather pale; with the exception of occasional red spots on the cheeks. The hands are often hotter than other parts of the body, and in one violent case I observed that the points of all the fingers were red, swollen, hot, and very painful. The appetite for food is lost; thirst considerable, but the stomach and bowels are not so much affected as they generally are in other febrile affections.

It has already been stated, that the disease is acute, and that suppuration takes place promptly, but there is often a difference of several days in different cases, though this difference is often more apparent than real. But few surgeons have the tact to discover matter while it is confined beneath the periosteum, and more especially where the part is covered by voluminous muscles, as is the case in the thigh. In this instance it is probable that an experienced surgeon might not be able to detect the presence of pus, till after it had made its escape through the periosteum, and accumulated to some extent in the soft parts.

I have observed that the locality of the pain, in the early stage of the disease, caused necrosis to be sometimes confounded with rheumatism. Most, even of its early symptoms, however, are very different from those

of that disease. The symptomatic fever and constitutional irritation come on sooner after the local attack, and are much more severe. The pulse, as described above, is also very different from that of acute rheumatism, it being smaller, harder, and less easily compressed. Suppuration, which very rarely occurs in rheumatism, finally removes all ambiguity. Necrosis, also, usually attacks at that period of life when rheumatism is not so liable to occur.

The fever attending necrosis is distinguishable from typhus by the local affection, by the pulse, which is harder and less easily compressed, and by its not being attended with so much stupor. The stomach and bowels are also much less affected; besides, there is the different expression of countenance, which is very apparent and characteristic to the eye, but is not easily described.

Causes of Necrosis.—The inflammation which produces necrosis of the bones, has sometimes been excited by blows and injuries inflicted upon the limbs. The sudden suppression of perspiration, by application of cold to the surface, has the same relation to this disease as to many others. In several cases I have known it to occur immediately after the patient had imprudently bathed in cool water, when the surface of the body was warm. It often, however, seizes the patient without the intervention of any obvious exciting cause, by which the lurking diathesis is sometimes developed, or concentrated upon a particular part.

It is customary with physicians and surgeons to ascribe necrosis to a *scrofulous* diathesis as its predisposing cause. This term is employed with much lati-

tude, and is often used, like the sign of an unkown quantity in algebra, to express something with the nature of which we are unacquainted. When used in this way, there is perhaps no impropriety in naming scrofula as the diathesis which predisposes to necrosis. Necrosis, however, is by no means to be identified in its nature with the affection of the lymphatic glands, to which the terms scrofula is, with more precision, applied, since necrosis may repeatedly occur in the same individual without being accompanied by lymphatic tumors. Whatever the remote cause may be, it is undoubtedly one which produces an enfeebled state of the capillary system, in consequence of which the nutrition of the bones, usually requirring the exercise of nature's powers in their integrity, is performed in an imperfect manner, and they become liable to the encroachments of disease.

Treatment.—I have already, I believe, hinted that it very rarely happens that this kind of inflammation terminates by resolution under the ordinary treatment. Though I have seen a very great number of cases of necrosis in their progress, yet the number of cases which have fallen under my care, in the first instance, has been small; almost all the cases of which I have had the management have been under treatment for a longer or shorter time before I have been consulted; so that I have drawn my inferences as to the effects of the different modes of treatment employed in this stage from what I have known to have been done by others, rather than from what I have myself done.

The treatment first resorted to has been, in some cases, bleeding; and in all, cathartics. Sometimes

emetics have been tried. The topical applications have been blisters, evaporating lotions, and cataplasms. In some cases all these remedies have been employed before I have seen the patient. But I do not recollect a single case in which I had reason to believe that the inflammation was seated in, or on the bone, that has not terminated in suppuration. One I recollect, in which I saw the patient on the third day after the attack, when I bled as freely as I dared to do, and kept the part constantly covered with cloths, wet with cold water, besides giving cooling cathartics; but suppuration, nevertheless, took place.

The following case will serve to illustrate the pathology of the disease, and the mode of treatment which I shall recommend. It occurred in 1798. The patient, a colored girl, nine years old. The attack was on the femur, and had been of sometime standing before I saw it. There was a large collection of matter in the thigh, which extended from a small distance above the knee to near the trochanter. An incision was made on the outside of the thigh, commencing near the knee joint, and extending upwards eight inches in length.—A large quantity of matter was discharged, and on examining with the finger, the bone was found denuded of its periosteum, from two or three inches above the articulation of the knee, upwards, two-thirds of its length; and near the lower end the whole circumference of the bone was stripped of its periosteum, excepting the linea aspera; which formed a kind of septum between that part of the matter deposited on the inside of the bone, and that on the outside. But on the anterior surface of the bone there was a free com-

munication, so that I could pass my finger over the bone, and turn it down to the linea aspera, where the muscles, tendons, &c. still adhered to the bone. At this time I had but little knowledge of the disease, and no book which I had seen rendered me much assistance. Benjamin Bell, in his Treatise on Ulcers, directs, in such cases, to perforate the bone down to the living parts, in order to produce exfoliation. This I had tried in several cases, but with no good effect. In this case, as the bone, to some extent, was exposed to the sight, I concluded to wait a few days, and see if granulations would appear on the denuded bone.—But in a short time the bone which was exposed to the sight began to assume a darker colour. I then determined to remove a portion of it, in such a manner as to go through the dead part, let that be more or less.—For this purpose I used the round saw employed in operating on the scull, applying it to the outside of the femur, nearly in the centre of the denuded part, and sawed through the walls of the bone down to the medullary substance, and then removed the piece circumscribed by the saw, which exposed to view a portion of the medullary substance, in extent equal to the diameter of the saw.

On sponging out the blood, the medullary substance appeared healthy, and was firm to the touch, but on looking attentively at it, I perceived purulent matter issuing, by pulsations, from beneath the sawed edges of the bone, and between the bone and medullary substance. I repeatedly wiped it away, and it continued to gradually issue. The walls of the bone being fixed, the matter was not forced out by their collapse, as it is in the

soft parts; but as there is an increase in the quantity of blood in the medullary substance, at each systole of the arteries, this substance is enlarged, and of course the matter is pressed out.

After the operation of sawing the bone, the wound was treated with the simplest dressings. In a few days after this, the bone, which was of a pearly white, a little verging to brown, where exposed to the external air, changed its appearance, assuming a carmine colour, and finally recovered, with no other loss of substance than a thin scale, which separated from the surface of that portion which had been touched by the saw, the whole of which did not exceed ten grains.

This case established in my mind the pathology of the disease and the proper mode of treating it; that is, when the disease has advanced so far as to form matter. But it would be a desirable thing to prevent the formation of matter in such cases, if possible. I have already stated that, in the common mode of treatment, this is rarely effected. I did not, however, intend to be understood that this is impossible, or that there is no other mode of treatment that might be adopted, which, if seasonably employed, might arrest the progress of the disease, prevent the collection of matter, and, of course, preserve the bone from injury, or the necessity of making a breach in the bony structure.

As the disease passes through several different stages, which require different modes of treatment, the practice must vary accordingly. If the surgeon has the good fortune to be called on the first attack of pain, supposing the disease to be in one of the long bones of the limbs, as soon as the disease, by swelling and ten-

derness of the part, has sufficiently marked the seat of the inflammation, an incision should be made, in a longitudinal direction, through all the soft parts down to the bone, and through the periosteum. The extent of the incision should be equal to the extent of the inflammation. Since I have adopted my present opinions of necrosis, I have not been fortunate enough to be called in till matter has been formed, and therefore have not had it in my power to test this mode of treatment, but have communicated my views on the subject to those who have had opportunities of applying them to practice, and in every case that I have heard of, the incision has arrested the further progress of the disease, and the case has been reduced to the state of a simple incised wound, which has soon healed, without any injury to the bone. This effects a very great saving of time, pain and confinement to the patient.

Necrosis, on the larger limb, is somewhat analogous to the felon on the finger, where the parts beneath the strong fascia of the part are inflamed. In both cases a fibrous membrane is concerned, and, as in felon, an incision carried through the fibrous membrane to the extent of the inflammation, stops the further progress of the disease—so, in necrosis, when the soft parts, with the periosteum, are divided, the disease is cured. After the incision, the treatment, both general and topical, should be such as we recommend in cases of simple incised wounds, attended with considerable inflammation; excepting that we should not try to approximate the edges of the incision by adhesive plaisters, but dress them with simple applications, such as lint, spread with simple cerate, and evaporating lotions applied to a

considerable portion of the limb, as least as far as the inflammation has extended. The general treatment consists in cooling purgatives, nauseating doses of antimony, and opium sufficient to allay irritation and procure rest.

When the disease happens to be seated on the spongy bones, as the os calcis, metatarsal bones, &c. the incision should be made in the direction of the muscles, tendons, arteries, &c. which may pass over it, so as to avoid wounding these organs. In other respects these cases are to be treated in a similar manner, as the above.

When the disease affects a bone thinly covered with soft parts, as the anterior part of the tibia, lower part of the fibula, or the humerus, clavicle, ribs, &c. surgeons at this day would not hesitate to make the proper incision. But when the femur is the bone affected it will be otherwise. The precise part affected is not so easily detected, and probably few practitioners would venture to make so bold an incision under such circumstances. But when the seat of the disease can be clearly ascertained, the propriety of making such an incision cannot be doubted; and when we consider that the pain and confinement consequent to an incised wound of almost any extent, is so trifling, compared with the evils attendant on a long-protracted case of necrosis in this bone, it should render us bold in directing the incision.

The second stage of this disease, when the matter has formed between the periosteum and the bone, still admits of a cure without any loss of bone. If, in this stage of the disease, an incision is made through the

soft parts, and the periosteum be divided as far as it is separated from the bone, and a portion of the bone be cut out with a saw, or several perforations be made in the bone which has been denuded, down to the medullary substance, so as to allow the matter collected between that substance and the walls of the bone to escape, the necrosis or death of the bone will be prevented. By this mode of treatment I have succeeded perfectly in arresting the further progress of the disease in the bone, and the patient has recovered without loss of any portion of it. If this mode of treatment be put in practice early enough, and the perforations be made in the bone sufficient to afford a free exit to the matter, it will always succeed. The best instrument for perforating the bone is a small trephine that cuts out a piece about the size of a nine-penny-bit; but I have often succeeded by making a number of perforations through the denuded portion of bone, with the perforator used in trepanning. When this instrument is used, there should be several perforations made, more or less, according to the extent of the denuded portion of bone, and the instrument should be carried a little into the medullary substance, otherwise the aperture will be too small to admit the matter to pass freely.—After this operation has been performed, the case is to be treated as we have directed, where the incision has been made before matter had been formed, that is, in the simplest manner.

In the third stage of this disease, the matter has made its escape through the periosteum, and obtained a lodgment in the soft parts, with more or less tumefaction of the part, and a perceptible fluctuation. The

treatment, in this stage, is precisely the same as in the second stage, but the favourable result is not so certain, as a portion of the bone may have been deprived of its circulation too long, or may be perfectly dead, and the separation between the living and dead bone may have commenced. In that case, the operation cannot save the bone entire; a portion must necessarily be cast off. Nevertheless, the incision should be made through the whole length of the collection, taking care not to divide any important parts, such as tendons or large arteries. The bone should then be perforated and a portion sawed out, so as to give free vent to the matter contained within it, and the wound treated as after the operation performed during the two first stages.

I would advise a free incision, with a view to the subsequent treatment of the case; for if a large portion of bone should be detached, it affords a better opportunity for its removal.

As we cannot always be certain whether the bone may, or may not, be in a recoverable state, the operation, though late, may prevent the destruction of any portion of it, as I have several times had an opportunity of witnessing, and when I had not expected such a result, on account of the length of time which had elapsed before it was performed. If a portion of bone should be cast off, the perforation will enable the operator, if it should require an operation for its removal, to break it the more easily, which is often a necessary part of the operation in removing a large sequestra.—The operation of sawing and perforating the bone gives no other pain to the patient than what arises from pressure of the instrument on the limb, which need

not be considerable. After the operation has been performed, in either stage of the disease, nothing more need be attempted, and no instrument, not even a probe, should be thrust into the wound. If the collection of matter in the soft parts has been great, and the discharge continues to be copious, the patient should take bark freely, and should be supported by as nutritious a diet as the stomach will bear.

In some cases, in which the discharge has been very copious, I have checked it by throwing in a solution of corrosive sublimate, of the strength of ten grains to a pint of water, to be repeated once in four or five days, and when the matter has been very offensive, a weak solution of carbonate of potash, thrown into the sore with a syringe, from time to time, removes the offensive odour.

As it will often happen, either from nothing having been attempted to prevent the death of a portion of the bone, or from the necessary operation having been delayed too long, that a portion of bone, of greater or less dimensions, loses its vitality, and becomes a foreign body, surrounded by the living parts. When this happens, if the portion of dead bone is of any considerable size, there will be a discharge of matter kept up as long as the sequestra remains.

The object of the surgeon, then, is to remove the sequestra. The first question is whether we shall attempt to remove the sequestra by an operation, or leave it to the unassisted efforts of nature, and the decision must be determined by contingent circumstances, like every thing else relating to our art.

If the portion of dead bone is small, and but a

trifling discharge of matter be kept up by it;—and if it is so situated that it does not give much pain, nor impede the use of the limb,—and especially, if it is situated near the surface, it may be left to the operations of nature, till it appears to be coming away, when its removal may be facilitated with the fingers or forceps.

But where the portion of dead bone is large,—a considerable discharge kept up by it, and especially when it deprives the patient of the use of the limb, an operation, undertaken for the purpose of removing it, is generally to be preferred, and the first question to be settled in such a case, is, at what time shall the operation be performed?

When the disease has not extended over the whole circumference of the bone, that is, when only a portion of one side of the bone is affected, the dead portion may be removed, if the operation be thought necessary, at any time after the dead bone is detached, which is generally in no very great length of time. This can be ascertained by the sound it gives on rapping it with a probe, or any other instrument, and more certainly by pressing directly upon it with the end of the probe, for sometimes we can perceive that the sequestra is moved by the pressure. When this cannot be perceived, if, when you fix the end of the probe directly on the dead portion of bone, you make considerable pressure upon it, and the patient complains of pain, you may be certain that the bone is detached, as such pressure will otherwise cause no sensation, for they are granulations which have started from the edges of the living bone that are hurt by the pressure. In such cases the dead bone had better be removed early, otherwise a new bo-

ny structure will be formed over the sequestra, which may make it necessary to remove some portion of the former with the saw, which would be avoided by a timely operation.

But when the whole cylinder of the bone has been destroyed, that is, when the sequestra consists of the whole bone for a certain portion of its length, the operation must be deferred till the new bony structure has formed round the sequestra. This is necessary to preserve the length and shape of the limb, for if the operation should be performed before this process is perfected, the member would be reduced to the state of a broken limb, with a deficiency of bone between the two ends of the living bone, and the limb would undoubtedly be shortened; and it is not quite certain that the bone would form in such a manner as to support the body.

It is not difficult to ascertain whether the new bone has formed round the sequestra or not. When this has taken place, there is considerable enlargement of the limb at that part of it, and it feels hard, as though the bone were much larger than *natural*, which is really the case, and if a probe is inserted into the opening, through which the matter issues, the dead bone will be felt, and around the edges of such opening the new bone also, though not yet firm and solid, and the probe may often be inserted between the new bony covering and the dead bone. *Under these circumstances, the sooner the operation is performed the better.*

Respecting the operation, the cases which occur are so peculiar, and require such different methods, that nothing more than general directions can be given.—The object, however, in every case is the same; that

is, to remove a piece of dead bone, which has become a foreign body as it relates to the living.

The instruments which may be wanted in this operation are a probe, knife, round saw, and one or more of Hey's saws, several pair of strong forceps, and a pair of cutting forceps. The elevator used in trepanning the skull is also an instrument which is often required in such operations. When we undertake this operation, we should be provided with all the instruments named, as we cannot always forsee at the commencement of the operation, what instruments we shall need before it is finished.

In some cases, where only a small portion of bone is detached, it may be removed with the common dressing forceps. But in a case where any considerable portion of bone is to be removed, it will be necessary to make an incision in the soft parts to some extent.—The length of the incision required will depend on the length of the sequestra to be removed, which may be estimated by the length of the enlargement of the limb, or diseased part. But, as the sequestra is always shorter than the new-formed bone, it will not be necessary to extend the incision the whole length of the enlargement; besides, if the first incision should be found insufficient to give us free access to the bone, we can enlarge it at any stage of the operation.

The better mode of procedure is—first, to insert a probe into one of the principal openings, through which the matter issues, or if there is more than one, to insert the probe into that which presents the fairest opportunity to reach the sequestra by an operation, and then to introduce the knife, and carry it upwards

as far as may be thought necessary, and if the sequestra extend below the probe, commence another incision from it, downwards, as far as may be deemed proper. The incision should be carried down to the sequestra, if there is no new-formed bone intervening, and if there should be, as is commonly the case, the incision should be carried down to it. It sometimes happens that, though the new bone has formed and partly enclosed the sequestra, yet we find a sufficient space open, or covered only with soft parts, through which we may extract the sequestra; and in order to effect this without sawing away the new-formed bone, it is often necessary to saw, break, or cut, the sequestra into two pieces, for it is often covered by the new bone to some extent, at each end, so that, by cutting it in two pieces, we can withdraw each through a small opening.

I would observe that, in making the incision through the soft parts, we should avoid wounding any artery of considerable size, and especially any tendon. We cannot always avoid wounding the muscles, but if they are divided in the direction of their fibres, no serious evil arises.

The treatment of the wound, after the operation, should be perfectly simple, and similar to the treatment of a simple wound.

When I first began to perform operations of this kind, I was under apprehension lest so much bruising and handling of the soft parts, as is sometimes necessary, to dislodge a large sequestra unfavourably situated, might be followed with bad consequences, and some of these operations have been the most laborious and tedious, both to myself and the patient, which I have

ever performed, yet I have never known any untoward circumstances to follow such operations, of which I have performed a great many.

If the whole of the sequestra is removed, the cure will be perfect; but if any portion of it is left, it will keep up a discharge, somewhat in proportion to the quantity of dead bone left in the limb.

As a supplementary to the foregoing Essay on Necrosis, I have subjoined the following interesting Case, which recently fell under my observation.

N. R. S.

Singular Case of Necrosis, in which a part of the Thigh Bone having been destroyed, the continuity of parts was restored by Ossification of the Muscles

John Lewis, a coloured boy, eleven years of age, small of stature, but hitherto healthy and active, was admitted into the Baltimore Infirmary, August 23d, 1829, for the treatment of disease of the thigh. The member was found to be tumid—something hotter than natural—soft, and apparently fluctuating in some places, and in others, especially near the knee, feeling as if the bone were irregularly knobbed. His general health was less impaired than might have been expected. The tongue was white, pulse a little quicker and more frequent than natural. Appetite rather inconstant, but rarely altogether absent. The skin was dry and harsh, but occasionally there occurred, at night, colliquative sweating.

After careful examination I became perfectly satisfied

that pus was present in considerable quantity, and that the bone was undoubtedly extensively necrosed. I therefore immediately made an incision into the outer part of the thigh, above the external trochanter. Unfortunately, although the fluctuation seemed here to be most distinct, this incision did not freely lay open the abscess, and there escaped but an inconsiderable quantity of pus. The instrument undoubtedly divided that portion of the vastus externus which arises from the external division of the linea aspera, and which forms a kind of partition between the anterior and posterior regions of the thigh. Two or three days after this, however, there took place a spontaneous discharge of fetid pus from between the ham-strings, near the knee. This opening having been dilated, the discharge became very copious, seeming to consist of crude pus, largely diluted with serous fluid, and containing flakes of lymph, precisely of the character that is discharged from ordinary scrofulous abscesses, except that it was unusually fetid. Through this opening I introduced a probe obliquely upward, and immediately encountered the denuded, rough surface of dead bone. But this being not directly accessible from the spontaneous opening, I immediately dilated the incision which I had previously made, and examined the diseased organ with my finger. I found that a prodigious abscess had existed immediately around the bone—that I was able with my finger to touch every part of the circumference of the bone at that place, and that the muscles and tendons were completely detached. The shaft of the bone was in this condition to the extent of five inches. The lower extremity of the dead portion was very near the junc-

tion of the shaft and epiphysis. The periosteum appeared to be entirely destroyed. Above, shooting from the lower extremity of the upper portion of healthy bone, were two or three irregular spiculæ of bone, by which nature seemed to be endeavouring to restore the continuity of healthy bone, and to enclose the sequestra. One of these projecting on the inside of the thigh felt like an exostosis. The sequestra was, however, no where detached from the living bone.

Such being the condition of the parts, I determined to wait the operations of nature; indeed, it appeared to me that no other course could at that time be prudently pursued. I was anxious, also, to observe, from time to time, the recuperative process which might be instituted. The patient, therefore, was put upon a gentle tonic plan of treatment, for the purpose of obviating the colliquative discharges which seemed to be in some degree wasting his strength. He was kept constantly in the horizontal posture, the limb being sustained in an easy attitude. In this condition he remained till the last of October. His general health was, in the mean time, not a little impaired. His tongue was white and occasionally dry—his appetite somewhat defective. He often had copious night sweats, and not unfrequently was annoyed with hectic diarrhœa, attended with griping pains. This could only be relieved by the free use of oak bark enemata. Opium had little or no effect in arresting it.

At the end of this time, I again presented the patient before the attending class—dilated the opening which I had first made—introduced my finger into the cavity, and carefully examined the bone. It was found to be

in the same state as before, except that it was more rough and decayed. I exercised some degree of force upon it with a lever, but found that it was still firmly attached at either extremity. There was still a large space between the bone and the surrounding parts, and no new bone had been formed in contact with the old. This cavity was filled with matter when means had not been recently employed to expel it, and, when emptied of it, the walls of the abscess were too rigid to collapse, but remained open and drew in air. On carefully examining the walls of the cavity, with one finger on the inside and another without, I discovered that they were formed of the internal layers of those muscles which arise from, and envelope the thigh bone. I discovered, too, that the most deeply seated fasciculi were evidently about being converted into bone—bony spiculæ were distinctly felt in many parts. The patient, in consequence of this disorganization of the muscles, had completely lost the power of moving the leg. I requested many of the medical pupils who were present, to examine the limb with care. Several gentlemen felt it, both within and without, and became satisfied of the condition of the parts.

I then remanded the patient to his bed, and directed that the same plan of treatment should be continued. I was careful that the opening which I had made should be preserved by introducing firm tents. My expectation was, that nature would soon effect the disengagement of the dead bone at its extremities from the living, and that the shell, then forming in the muscles, would restore the continuity of sound parts. The patient was suffered to remain in this condition (being occasionally

examined,) till December. I then became alarmed for the safety of my patient, on account of the very copious and offensive discharge which continued to be poured from the limb. The whole ward in which he lay was filled with the stench, and the dressers had extreme difficulty in the discharge of their duties. The hectic symptoms were more decided, and he appeared to be evidently losing ground. The shaft of dead bone seemed, indeed, to be operating as an immense foreign body to keep up irritation in the part. Amputation was thought of, and in this state of things would, no doubt, have been justifiable.

I determined, however, although the bone was still firm, to attempt its removal—thus to withdraw the source of local irritation, and to place the limb in the condition of a *fractured thigh*—trusting to the process which was then going on in the muscles to re-establish the continuity of the bone. I had so far succeeded in dilating the incision which I had previously made, that the bone, to a considerable extent, was easily accessible. Before applying an instrument to the bone, however, I dilated this opening upward, where the dead portion of the shaft extended beyond the reach of my finger. Then, with the chisel, Hey's saw, bone-nippers, levator and strong forceps, I succeeded in breaking up the dead bone. As soon as I had cut it entirely across, in one place, I discovered that the thigh was in the condition of a fractured member, and that a considerable degree of motion took place at the point of fracture.

Having removed nearly all the dead portion of bone, (to the extent of about four or five inches of the shaft,) I extended the limb, and, as the most convenient for

this object, applied the apparatus of Hagedorn for the purpose of gently extending the thigh, and preserving its rectitude. The patient was placed on his back, upon a firm mattrass, and subjected to such treatment as the constitutional symptoms seemed to require. For a time the discharge was as copious as before, and equally as offensive, but, in the course of two weeks, it began sensibly to diminish, as did also the hectic symptoms which appeared to have arisen from so exhausting a discharge. The cavity formed by the removal of the bone began to fill with granulations, and, from time to time, the limb appeared to become more and more rigid. At last, at the end of about eight weeks from the time of the operation, the limb was found on examination to have perfectly healed, there remaining not even the smallest fistulous orifice for the discharge of matter.—The limb felt firm and sound, and had become so rigid that he could raise it without assistance horizontally from the bed. The splints were then thrown aside, and, at the end of a few days from this time, he was able to leave his bed and to hobble upon crutches. At first he appeared to have no muscular command over the leg whatever. But, by constant efforts the leg appeared, at length, to become slightly moveable, and the patella began to play. On examining the limb this day, March 27, 1830, I discover that he is able to bear his weight upon the member, and even to walk a little, without the aid of a crutch. The limb is much larger in diameter than natural. In place of the bone there seems to be a large mass of callus. The knee, leg, and foot, have their natural attitude—the patella plays with some freedom—he can slightly flex and extend his leg

by the effort of the muscles. The limb is, however, nearly an inch shorter than the other. This circumstance arose from the difficulty of maintaining permanent extension in his feeble state (though, by the way, I have very little confidence in the utility of permanent extension in any case. No part of the body, not even the soles of the feet, can bear continued pressure, for a considerable time, without injury.) The condition of the lad is, therefore, such that I have no hesitation that, as regards its utility, the limb will, in a short time, be almost perfect.

OBSERVATIONS

ON

FRACTURES OF THE FEMUR,

WITH AN ACCOUNT OF A NEW SPLINT.

In the treatment of fractures, the first object is to place the extremities of the fractured bone in accurate apposition. In general, this is accomplished without difficulty. It sometimes, however, happens that the muscles are so contused, or otherwise irritated, as to become morbidly rigid, and to resist a considerable degree of force although the limb be placed in the most favorable position for the reduction. Under these circumstances, it is with some difficulty that the fractured surfaces are brought in contact with each other. If the position of the limb be injudicious in relation to the action of the muscles, or if the force be suddenly and unequally applied, the difficulty is often insuperable.—When, however, the contraction has been overcome by the necessary degree of extension, if the fracture is at all oblique, the muscles will repeat the displacement as soon as the extending force is discontinued; consequently there is indicated the employment of a perma-

nently extending force, a remedy which, from the difficulty that attends the employment of it, and from the want of tact in adjusting it, is exceedingly equivocal in its results, often defeating its own object, with regard to the limb, and occasioning a great deal of suffering to the patient.

The principal difficulty, then, in the treatment of fractures, is not in the manual operation of reducing the bones to their places, but in keeping them accurately there till union can be effected. This difficulty, however, does not altogether consist in the liability of the limb to be shortened by the contraction of the muscles, but also in the tendency which is there to the other kinds of displacement. The limb, below the fracture, may assume such a position, that the axis of the inferior fragment may not coincide with that of the superior, but may make an angle with it; or the limb may rotate, so that the fractured surfaces shall not correspond. This often occurs in fractures of the thigh, from not properly supporting the foot, which, acting transversely upon the axis of the limb, operates like a lever to rotate it. Or, finally, there may be a displacement of the fractured extremities laterally, occasioned by the unequal action of the muscles, or by the limb not being equally supported.

The liability to these kinds of displacement and consequent deformity will depend, in a great measure, upon the length and weight of the limb below the fracture. It is obvious that the greater the length the more power will the weight of the extremity have to bend the limb, and the less apt will the portion below the fracture be to accompany the part above in those mo-

tions which it is impossible to avoid. The nature of the difficulty, in these cases, should indicate the means which are best calculated to remedy it, and hence it is obvious that the most important indication is to employ such an apparatus as shall command the whole limb, so that the part below the fracture shall preserve its proper range with that above, and in the different motions which may be necessary, that the whole shall move as one, the fragments maintaining their relative position in all respects.

Another important circumstance to be attended to is the attitude of the fractured limb, which should be such that, as much as possible, the antagonizing efforts of the flexor and extensor muscles may be made to balance each other. From the neglect of this circumstance, almost every kind of evil to the limb is liable to occur; the muscles will exert an unequal force laterally, tending to lateral displacement; the contractile force to be overcome must necessarily be greater; the application of the extending force can not be made in the direction of the axis of the broken bone, and in addition to all these, the ease and comfort of the patient, so necessary to the healthy process of union, are greatly impaired.

Another object to be attained is, so to contrive the apparatus that the patient may be moved from place to place, or taken from one bed and laid upon another, without injuring the limb, or retarding the cure; for it is no small penalty to be confined on the back for forty or fifty days.

The above are the principal indications to be kept in view. But while we attend to them, there are certain

injurious circumstances to be avoided, or obviated, which might frustrate our intentions, or give the patient unnecessary pain and inconvenience. The most important of these is injurious pressure. This is often produced in two ways; and first, by the weight of the limb resting upon a small part of its under surface.—This cannot be continued for any length of time, even although it rest upon a cushioned support, without producing injurious effects. The softness of the support is too often a circumstance which deceives the surgeon. A little reflection, however, must convince every one that, if the weight of the limb rest upon an inch square of surface, the effect will be the same, whether it rest upon eider-down or adamant, provided the surface of the latter be accurately adapted to that of the limb.—To obviate this difficulty and source of injury, the support upon which the limb rests, whatever it may be, should be so adapted to the whole under surface of the limb, as to divide the pressure as equally as possible throughout every part of it. If this be done, it will make no difference whether the support be hard or soft, the benefit of soft substances as an easy support consisting entirely in their receiving the weight upon a greater surface, and thus dividing the pressure more equally.

The other kind of injurious pressure, which is often, I may even say generally, produced upon fractured limbs, is occasioned by the application of splints and bandages immediately to the neighborhood of the fracture, with a view to keeping the extremities in place by means of lateral pressure. This occasions injury by the partial contact of the narrow or flat splints bound

tightly to the limb, and which, notwithstanding the compresses which are interposed, gall and chafe it in particular places. The circular bandage, by making pressure entirely around the limb, intercepts the returning blood in the veins, and causes the limb to swell below the bandage; or if the limb be equally bandaged throughout, impedes the healing process to which a free circulation is necessary, or irritates the soft parts by pressing them upon the fractured extremities, and not unfrequently, by the inflammation and ulceration which is produced, converts simple fractures into compound.

This kind of pressure is employed from a mistaken notion, which prevails too generally, that such bandaging and partial bracing of the limb contribute much to keep the bone in place. If surgeons, who are in the practice of applying bandages tightly around fractured limbs, would take the trouble to investigate the subject, I think they would perceive that such practice can do nothing but mischief. They cannot be applied sufficiently tight to prevent the shortening of the muscles without interrupting the circulation, and it is doubtful whether *any* degree of tightness would aid in the least, to effect this object; nor can they contribute at all to prevent displacement of the extremities, if the limb below the fracture is moved from its proper position, or if the limb above the fracture is, by the motions of the body, moved out of its relative and natural position. If, in a case of compound fracture, in which the ends of the bones are in sight, or in which they can be touched by the finger, the surgeon will take hold of the limb below the fracture, while he keeps his

finger on the fractured ends of the bone; he will find that, by moving the limb into its proper relative situation with the limb above the fracture, the bones will readily come into apposition; but if he attempts to bring the ends of the bones into apposition by pressing them down with his fingers, he will find it utterly impossible to do it with any force, unless he moves the limb below the fracture with the other hand. The weight of the limb is acting against him at the end of a lever which gives it an infinite advantage. For this reason no pressure which the limb can bear without destruction will prevent ends of the bones from being displaced, if the limb is moved out of its proper position. This mistaken idea of the utility of bandages in maintaining the natural form of the limb, and the necessity of them to attach the splints which are commonly used, has led to an unremitted employment of them, which could not fail to be exceedingly injurious, even were they capable for a time of effecting the objects for which they are intended. It is too generally presumed that, when a fractured limb has been once dressed, or set, as it is vulgarly expressed, it must remain perfectly fixed till the bones have united; and as it receives its support from the splints which are commonly employed chiefly through the medium of the bandages, there is generally a great unwillingness to relax the support by loosening them; nor indeed can it be done, as the apparatus is usually applied, without occasioning more or less displacement. There is often, however, a more insidious and much more fatal mischief resulting from this apprehension of relaxing the supports of the limb. The unreasonable fear of un-

binding it, thus enveloped as it is in the dressings, for the purpose of noticing its condition, is a timidity which has proved the destruction of many limbs and some lives, and almost always occasions excruciating torment to the patient. It is rare that bandages encircling the limb are not either at first applied too tightly, or become so, soon after their application, by the swelling of the limb. To the surgeon a part of the dressings may appear sufficiently loose, while by the unequal swelling of the limb, other parts may occasion and conceal a great deal of mischief.

It is unnecessary that I should speak of the great variety of methods which have been employed to maintain the reduction of fractures of the thigh, in order to point out in them the deficiencies which I have spoken of above. Observation and reflection will, as I think, convince every one that the difficulties which I have enumerated are completely obviated by none of them, and that they are for the most part deficient in the general principles which govern their application. I would particularly, however, call the attention of my readers to that which is now used almost exclusively by scientific surgeons, and which, with its modifications appears to be regarded, though acknowledged very often to fail, as the *ne plus ultra* of inventions for this particular purpose. I mean the method of Desault.—This is so familiarly known that I will not attempt to describe it minutely. The principal object, which this apparatus is intended to effect, is permanent extension. One long splint is essential to it. This, in the original apparatus of Desault, was a flat piece of wood applied by bandages to the outside of the limb, with compres-

ses intervening, extending above the hip and below the foot. Oblique bands were cast between the thighs and over the extremity of the splint, which thus effected the counter extension, while extension was made by passing bands from the ancle and foot to the lower extremity. Short splints were also bandaged to the thigh, and the whole was closely enveloped in dressings.—The patient was of course confined to his back, and the limb was made to rest upon cushions throughout its whole length. The above apparatus has been ingeniously modified by Drs. Physick and Hartshorne.—The former gentleman extended the superior extremity of the long splint to the axilla, in the form of a crutch, with a view to relieving the perineum from the galling pressure of the counter-extending band; the latter, by employing two long splints, divided the resistance more equally around the base of the limb.

The first objection, which occurs to every variety of this apparatus, is the attitude of the limb, by which an unequal degree of tension is produced in the flexors and extensors. It is obvious, that when the thigh is extended upon the pelvis, and the leg upon the thigh, all the extensors have their utmost degree of relaxation, while the flexors have a corresponding degree of tension. It is said, indeed, that, although this posture is at first painful to the patient as being unusual, yet, when the extension has been continued for a time, the contraction of the muscles is overcome and he ceases to complain. This, however, is only an evidence of what mechanical force can effect, and that the muscles, after the extension has been continued for some time, become paralysed, and their sensibility obtunded. It

does not prove that the two classes of muscles, which are thus unequally stretched, exert an equal degree of force obliquely upon the bone; for although their vital contractility may be suspended, we know that the contractility of texture increases with the increased degree of extension, so that although the sensations of the patient do not indicate it, yet it is absolutely certain that an effort is constantly making by the muscles to displace laterally the bones to which they are attached.—It is obvious, also, that a greater degree of force will be necessary to give the limb its natural length, than if the muscles are in harmonious relation with each other.

A little reflection must also convince us that, under these circumstances, it is impossible to make the extension precisely in the direction of the axis of the thigh-bone; for the force which is applied to the limb below the fracture, is communicated to the part which is above, wholly through the medium of the muscles, and this will chiefly be done by those which are the most tense. These will be drawn into the line of direction in which the force acts, while the bone, not being equally supported on the opposite side, will be crowded from it. The more nearly the muscles antagonize each other, the more nearly the extension be made in the direction of the axis of the bone, and *vice versa.*

Another objection to this apparatus is, that the support which it receives from beneath, although it rest upon cushions, is, for reasons mentioned above, necessarily confined to a small part of the surface, and must occasion pressure more or less injurious. Another great inconvenience to the limb and to the patient, arises from the support not constituting a part of the ap-

paratus attached to the limb, and consequently not moving with it, in the different unavoidable motions.

The remarks, which were made upon the pressure of flat, straight splints, and circular bandages, are applicable to this method.

The apparatus which I have used for several years past was designed to answer the general indications of which I have spoken, and was the result of long experience of the difficulties which attend the treatment of fractures generally, and particularly those of the thigh. It consists of two thin broad pieces of wood* so warped as that the concavity of one shall correspond to the convexity of the under surface of the thigh, and the other to that of the leg. The lower extremity of the thigh-piece, and the upper extremity of that of the leg, are jointed together. This is done by paring out the margin of each of them, in the middle, so as to make them deeply concave. The projecting corners of the extremities, which are thus produced, are applied to each other, so that those of the thigh-piece embrace and overlap those of the leg-piece, and each pair being fastened together by a pin, performing the office of a pivot, a perfect hinge is produced, which admits of no other motion but flexion and extension.—The superior margin of the thigh-piece is then pared away, so as to adapt it to the shape of the pelvis against which its circumference rests. Where it presses upon the pubes and the tuber of the ischium, as it may be made to do, it should be bordered with soft leather, and stuffed. The leg-piece is to be made longer and

* Bass is that which I have employed, as being more flexible, and less liable to split than almost any other.

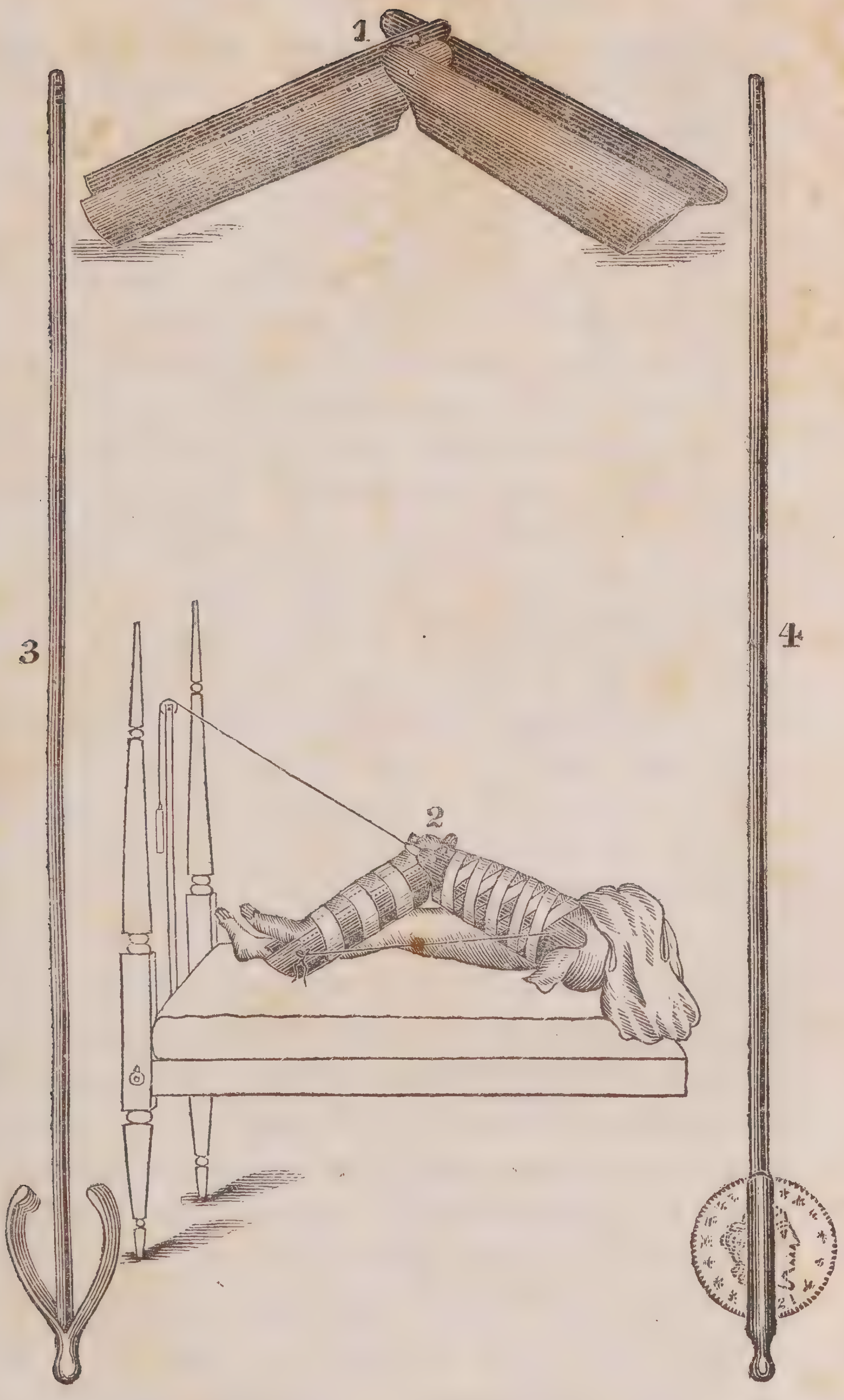


Figure 3 and 4 represent an instrument hereafter to be described, designed for removing coins from the œsophagus.

larger than the leg, and as its concavity can not be exactly adapted to the convexity of the calf of the leg, this part of the limb is to be slung in the splint, by means of strips of cloth, or leather, which pass across it and hang loosely into its concavity, being attached to one side of the splint by tacks, and on the other by hooks or buckles, which will admit of their being tightened or loosened, as may be necessary, without disturbing the limb. The circumference of the thigh-piece is to be a little less at the inferior than at the superior extremity, to adapt it to the tapering shape of the limb.—A strap, passing from the upper extremity of the thigh-piece, to the lower extremity of that of the leg, will enable the surgeon to fix it at any angle that he pleases.

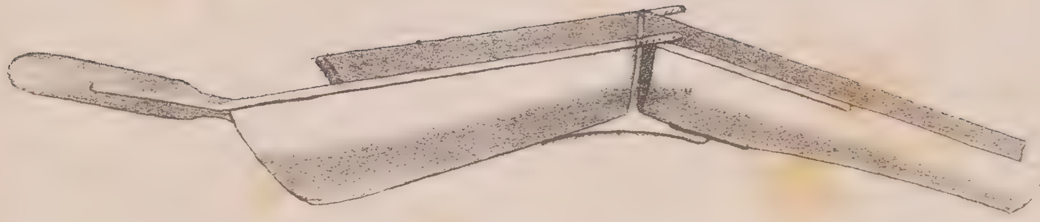
In applying it, there may be laid along under the whole splint, bands of firm cloth, long enough to embrace the splint and the limb. A broad linen cloth may be laid in the thigh-piece. The limb is then to be carefully laid in the splint, the size of the one having been adapted to that of the other by measuring the sound limb; the linen cloth may be folded over the limb, and the whole splint then secured to it by overlapping and pinning the bands along its whole length from the hip to the ancle. As the pieces of the splint are flexible, they will be made by the bands to embrace the limb firmly enough, although they may not have been precisely adapted in size. In most instances, in which the limb has been thus dressed, almost every source of irritation being avoided, and the attitude natural and easy to the muscles, I have not found it necessary to use permanent extension. I am confident that the necessity for its use is often occasioned by the apparatus

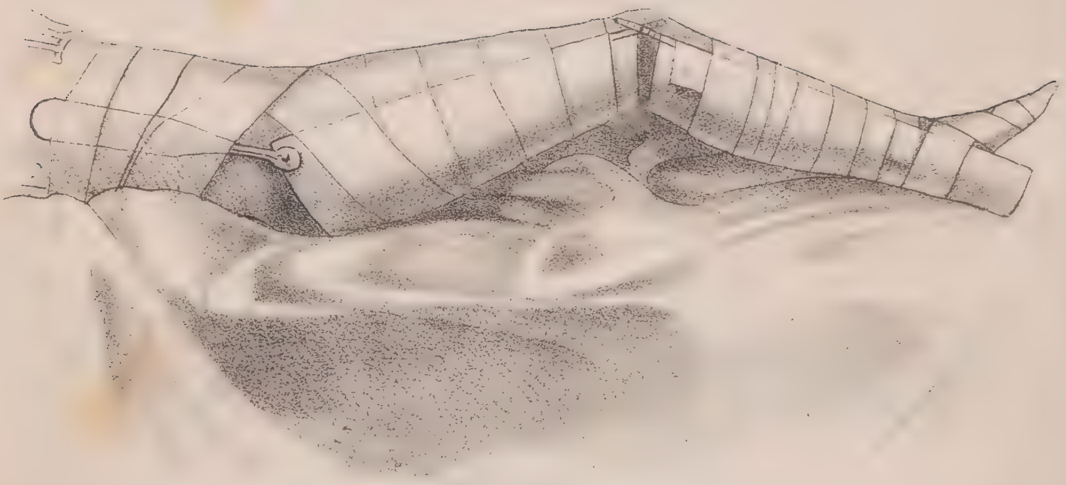
itself which is employed to effect it. Where, however, the fracture is very oblique, and the muscles are disposed to contract and shorten the limb, I have employed a mode of extension, which can be graduated to any degree of force, and which may always be made in the direction of the axis of the thigh-bone. It is accomplished by lacing a soft band of leather round the leg, just below the knee, and to this attaching a cord, which is carried in the direction of the bone over a pulley in a stand nailed to the foot of the bed, and which may be lowered or raised at pleasure. To the end of the cord is attached a weight, equal to the necessity of the case. The weight of the body makes the counter-extension, which may be increased, if necessary, by raising a little the foot of the bed.

The reader will readily perceive that, by this apparatus, all the indications which I have spoken of above are intended to be answered. The limb may be placed at any angle which the muscles may require, without at all disturbing the fracture. It is completely protected from hurtful pressure, as it rests upon the whole surface of its semi-circumference, and as it is no where girt by bandages, being protected from their unequal pressure by the splint, suffering them to touch it only on its upper surface. Along the angles of the splint and bandage, there is no pressure at all, so that the blood returns with perfect freedom. The weight of the leg being perfectly commanded by the lower piece, and the limb easily fixed in any position, its control over the fractured extremities is completely obviated. The splint being light, and the whole of it attached to the limb, and the support being the splint itself, there is no

difficulty in moving the whole limb as one, or in transfering the patient from one bed to another. The bandages may be at any time relaxed without the least danger of disturbing the fracture, they being only necessary to secure the limb when it or the body moves. It is to be particularly noticed, as one of the excellencies of this method, that the weight of the limb itself, and the reaction of the hollow splint in which it is lodged, constitute all the force, which, under ordinary circumstances, is necessary to maintain the reduction. It is particularly adapted to compound fractures, which may be examined and dressed, without in the least disturbing the limb, and even although the wound be on the under surface, by cutting away a portion of the splint opposite to it. The few words which are necessary to describe this splint are a sufficient evidence of its simplicity: almost any person can construct it in a very short time. The objections of complication, and expense, therefore, which prevent the general use of some others can not be made to this. I do not, however, rely solely upon the theoretical principles which indicate its use. Its present form is the result of twenty years extensive experience in the employment of some modification of it, and I never have seen sufficient reason to induce me to abandon it for any other.

The reader will have no difficulty in forming an idea of the splint and its appendages, by attending to the cut, figure 1 and 2.





Lith. of Endicott & Swett.

DESCRIPTION

OF AN

IMPROVED APPARATUS FOR THE TREATMENT

OF

FRACTURES OF THE THIGH & LEG.

BY N. R. SMITH, M. D.

Observation has thoroughly convinced me, that no instrument will be generally employed in the treatment of Fractures, but one which is made with facility—cheaply, and of common materials; one, also, which is applied with ease and dispatch. Very few practitioners are so provident as to have, always ready for exigencies, instruments of a complicated and expensive construction. Even if they possess such, they are extremely apt to be out of repair, and to be generally unfit for use on the spur of occasion. The surgeon, therefore, will do most for this department of practice, who devises an instrument which any individual, with common ingenuity, can construct in a short time, out of materials easily procured.

It is also important that the instrument employed should be one, that when once applied, shall not require constant watching in order to keep it properly adjust-

ed; for if this should be the case, it will certainly fail of accomplishing its end. Experience has suggested, and will confirm this assertion. It is scarcely necessary to say that the apparatus, at the same time that it is simple and permanent, must accomplish, in a satisfactory manner, the indications for which such machines are designed. Whatever apparatus does this, in the best manner, consistently with simplicity of construction, and ease of application, will certainly become the most useful and the most generally employed.

Mr. Amesbury's apparatus for fractures, is probably better calculated to accomplish the indications of treatment, than any other which is at present employed by European surgeons; but it is so complicated in its construction—so expensive and difficult to procure, that although its adaptation is very generally admitted, it is rarely employed, except in hospital practice.

The apparatus here represented is similar to Mr. Amesbury's in the principle by which it acts. It is designed, indeed, to accomplish nearly the same indications, but is so simple in its construction—formed of such common materials, and those so easily put together, that any ordinary mechanic, or, indeed, the surgeon himself may prepare one in a very brief time. The cost of the instrument is trivial.

The material which I now use for the body of the splint, is a very stiff paper trunk-board that can be procured. If those which are very firm are not to be had, two of them should be pasted together. The size of one board, if it be properly cut, is generally sufficient for both the thigh and leg-piece. Sometimes I have had the apparatus made of tin, and I have no doubt

that thin sheet iron would prove a very excellent material. Formerly I used to make them of bass or poplar boards, of the thickness of a quarter of an inch, warmping them with the aid of steam, or hot water. A pupil of mine informed me that, in the country, upon the spur of occasion, he had once made one of the bark of a sapling chestnut. It was sufficently firm, and answered the purpose in all respects extremely well. This may be a valuable hint to country practitioners.

But the material which I prefer, is the very thick trunk-board. This I cut in two pieces, one for the thigh, and the other for the leg. The thigh-piece ought to be, for an adult, about sixteen inches long, thirteen inches broad at its superior extremity, and ten at the lower. The leg-piece should be about nineteen inches long, and ten broad at both extremities. These pieces are then to be very slightly moistened with a wetted sponge, or cloth, and then to be bent into a semi-cylindrical shape with the hand. The concavity, however, should be a little deeper than a semi-cylinder, in order that the sides may rise a little above the middle of the thigh, and be somewhat flattened. I have been accustomed to shape these pieces on blocks of wood of the proper form. I warp them over these whilst moist, and binding them firmly with a cord, leave them till they are dry, when they will retain their shape permanently. The block for the leg may, if a very neat apparatus be desired, be shaped, at its upper and back part, like the calf of the leg, swelling out like it. When the board is bent upon it and properly moulded, it will be adapted to the calf of the leg.

The upper part of the thigh-piece is now to be care-

fully pared away, in such a manner as that, when it is applied to the member, the superior margin shall be properly adjusted to the perineum on the inside, and to the tuberosity of the ischium behind. On the outside it may be suffered to project in the form of an angle a little above the trochanter. It is obvious that it must be deeply cut away on the inside, to fit the perineum. A glance at the plate will give a better idea of this than words can convey. The lower extremity is also to be truncated obliquely, so that the lower convex part shall not project so far as the angle, by about an inch and a half.

The angle of the thigh-piece, which projects above the trochanter, is now to have a piece attached to it, which may extend up along side of the body, and be bandaged to it. Sometimes I have done this by nailing a piece of wood to the side of the splint, so as to make a suitable angle. But the better mode is to use a piece of iron, of the thickness of an eighth of an inch. This may be made without a hinge, having an angle at the corner of the thigh-piece, the lower leg of it being four or five inches long and applied to the side of the splint —the other, six or eight inches long, and ascending on the side of the body;—or there may be a hinge made at the angle, by merely making the two pieces, which there will then be, a little broader, and rivetting them together at the angle. This will enable the operator to adjust the angle to the attitude of the limb. The lower piece of this hinge may be continuous with the piece which extends down to the lower extremity of the thigh-piece, to fortify one of its angles there; this will render the whole more firm.

The iron should have numerous small holes made in it. Through these it is to be nailed to the splint, which can easily be done, with great firmness, by placing an iron upon the inside of the splint, and clenching the tacks securely on the inside. The upper piece of the iron hinge is to be nailed, in the same manner, to a piece of binder's board, a little broader and longer than itself, and then to be bent a little inward.

The two lower angles of the thigh-splint are also to be fortified with thin pieces of iron, extending up, along the sides of the splint, the one on the inside about six inches—that on the outside continuous with the hinge above. They should project beyond the angles, about two and a half inches, and be pierced with holes half an inch apart.

Where the thigh-piece is applied to the perineum and tuber of the ischium, the margin should be wrapped with three or four folds of soft, old blanket, and this covered with leather.

The leg-piece should be shaped at its upper extremity like the lower end of the thigh-piece, and fortified in the same manner with pieces of very thick sheet-iron these, however, not projecting beyond the angles, nor having holes, but, instead of them, having short strong pins projecting from the outside, adapted to the holes in the irons attached to the thigh-piece. I think it well that the concavity of the upper end of the leg-piece should be a little deeper than that of the thigh.

When I have been desirous of making the apparatus a very complete one, I have appended to it a contrivance for fixing the thigh and leg-pieces at any angle that might be desired. This consists of two pieces which

are attached, the one to the thigh-piece, and the other to that of the leg. The former is a piece of flat steel three fourths of an inch broad, and about ten or twelve inches long. At one extremity it is broad and pierced with holes, for nailing it to the back part of the thigh-piece. The other end is narrower, and at a quarter of an inch from its extremity, it is bent up at a right angle. This piece when attached to the thigh-splint projects beyond it, down four or five inches on the back part of the leg-splint. It should have a spring temper.—The piece attached to the leg-splint is merely a piece of sheet-iron, or tin, fastened to the back part of the leg-splint. In this there are transverse slits, half an inch apart, to receive the bent extremity of the spring. Whenever the leg-piece is bent upon that of the thigh, the spring will catch in one of these slits and immediately fix the two splints at a permanent angle; and by adjusting the spring to one or other of these holes, they may be fixed at any desired angle.

I would observe, that in using tacks on the binder's board, for the purpose of fastening the various appendages, a little piece of leather should always be put under the head of the tack. When this is done they hold very securely.

When the various pieces of the apparatus are thus put together, the paper should be brushed over with strong glue-water, and as often as it dries this should be repeated three or four times. At last it should be varnished with the black spirit-varnish used by saddlers, to prevent its imbibing moisture, and sticking to the limb and the bandages.

Mode of applying the Apparatus.—One of the excellencies claimed for this instrument, consists in the ease and dispatch with which it may be applied.—Commonly I place within the thigh-piece, (in case the fracture be one of the thigh, and it is only in relation to this fracture that I am now speaking,) a linen cloth, to keep the skin from contact with the splint. Across the leg-piece I place two bands of firm cotton or linen cloth, about two and a half inches broad, and about half a yard long. One of these is across the upper part of the leg-splint, just below the joint, and is suffered to drop, like a festoon, deep into the hollow of the splint, but not quite to the bottom, as it is designed to support, in some degree, the upper part of the leg. Below this, the calf of the leg will rest in the hollow of the splint. The other band is to be laid across the splint, in the same manner, at the part which will receive the ankle, and is designed to sustain that part of the limb, in such a manner that the heel may be prevented from touching the splint, a circumstance which always creates pain and may produce displacement.—The limb having been coaptated, is then to be carefully raised by the hands of assistants, who at the same time keep it carefully extended. The surgeon then brings the thigh-piece separately under the member, and adapts it to the whole lower part of the thigh, and nicely adjusts it to the perineum, ischium, and hip. The assistants grasp this piece and sustain the thigh in it. The surgeon then takes the leg-piece and bringing it beneath the leg, places that member in it, in such a manner that the upper part shall bear on the upper cross-band, the

calf resting in the hollow of the splint, and the ankle on the lower band. The iron pieces at the upper extremity are then to be fixed in the upper holes of those of the thigh-splint, and the two pieces may then be adjusted at such an angle as may be desirable. Near the knee, it will be necessary to interpose, between the splint and the member, small compresses. The bands on which the leg partly rests are to be drawn to the necessary degree of tightness and pinned beneath the splint. The whole limb now being suffered to repose in the splint, the patient is almost perfectly at ease, whilst the surgeon proceeds to apply the bandage that is to secure the member in the apparatus.

The bandages consist merely of two rollers, one for the leg and the other for the thigh. These should each be at least four yards in length. The surgeon commences the application of one of these on the foot, as in the ordinary way of bandaging the leg. After two or three turns, he carries it obliquely across the instep, over the margin of the splint, and underneath it to the other side. Then it is again carried obliquely down over the instep, and once round the foot—then again beneath the splint, and spirally up the leg, binding it to the splint. It stops at the knee, so as to leave the angles exposed. Then the surgeon applies the second roller to the thigh, beginning just above the knee, and including both thigh and splint. But the application of this bandage to the hip is highly important. When it has been carried by direct circular turns as high as the perineum, the bandage having reached a point opposite to the great trochanter, is thrown obliquely upward across the hip—over the lower part

of the belly and round behind the back—then obliquely down over the anterior part of the hip, into the perineum and again round the thigh.

This turn is to be repeated once or twice, and then the roller is to be carried circularly round the body, two or three times, to bind the projecting piece to the side. These circular and oblique turns should be made with great care, as they add very much to the firmness of the apparatus, and the support which it gives to the limb. It makes the thigh and body one piece, a very important indication as we shall presently see.

This being done the surgeon, for the purpose of giving as much extension to the member as it can endure, grasps the leg, together with the lower piece, (while some one supports the thigh) and detaching the angles from the upper holes of the angles of the thigh-splint, moves them downward as far as appears to him necessary to make the proper degree of extension.—As the leg is snugly embraced by the lower piece, and as the upper piece is firmly resisted by the perineum and tuberosity of the ischium, the thigh-piece is in effect lengthened by this movement, and the thigh permanently extended. This extension may evidently be increased or diminished at pleasure.

Its application having been thus accomplished, the apparatus, with the limb, is to be placed upon a firm mattrass, and sustained by a bolster placed under the splint below the knee. There is then scarcely a possibility of its getting displaced, as, if even the bandage be removed, the limb sinks so completely into the cavity, that its support will be perfect. The apparatus must never be fastened firmly to any part of the bed. This

is a very injurious expedient in the application of any apparatus. Whatever splint is used should, in my opinion, be attached to the body of the patient, and always move with it. If it cannot be moved with the limb, in consequence of its weight, or because of the manner in which it is applied to the bed, the involuntary movement of the patient's body from the yielding of the mattrass, or the impossibility of preserving one uniform attitude, will certainly change its position, in relation to the splint, and drag with it to the upper fragment of the bone. It is easy to conceive, how, if the apparatus be fixed to the bed, the slightest lateral movement of the body will cause the thigh to press unequally on one side of the splint, and bend the limb at the place of fracture. For the purpose of obviating this difficulty still more completely, I have, in some instances, suspended the whole apparatus, or rather the lower part of it, by means of pieces of hoop, nailed together and placed over the foot and knee. To these, cords were attached, and then secured to the splint. When they are drawn sufficiently, the whole apparatus and limb will be made to swing clear of the bed. This will be found a very useful expedient. But it is by no means essential to the utility of the apparatus which I have here described, that it should be even as complex as is here represented. If it be necessary to provide one on the instant, any individual can construct one in a few minutes, which will serve very tolerably for a single case, by preparing the two hollow splints of binder's board, or of warped wood, or of chestnut-sapling bark, and then, the ends being cut so that the angles will project farther than I have before described, pinning the angles toge-

ther with wooden pegs, clenched nails, or tacks. The length of the thigh-piece should be such as to keep the thigh gently extended, and it should project an angle of considerable length along the side of the body. The oblique turns of the bandage around the hip and body are then very important. The bands across the leg-piece are to be used as before, and by drawing or relaxing the upper one, the degree of extension of the thigh may be slightly increased or diminished. The same thing may be accomplished in part by increasing the thickness of the pad in the perineum. The whole apparatus must be swung up; and this is more important than when the splint is more complete, in order that it may not be displaced in relation to the body. It will be necessary also to support it a little beneath the knee, in order to sustain the angle.

The utility of the apparatus in its most perfect form will be best explained by adverting, for a moment, to the various indications, which ought always to be accomplished in the treatment of a fractured thigh.

1. It is of great importance to give equal and firm support to the whole thigh and leg, and to distribute the pressure, which the support occasions, as generally as possible over the whole inferior surface of the limb, relieving the prominent points—the heel, hip, &c. as much as possible. Those who have used the more imperfect splints for this purpose, (and especially those who have worn them,) know well the annoyance which the patient suffers from the imperfect accomplishment of this indication. The point of the heel is a part which suffers exceedingly, and is often made to slough. The whole inferior face of the limb lying upon a surface

which is not at all adapted to it in form, must be galled in various parts. Surgeons are not generally aware of the mischiefs which result from this local irritation.—The mere topical injury is the least of it. When any hard substance is pressing upon a part so as to cause constant pain, there is always an involuntary effort, on the part of the muscles, to withdraw the part from the irritating substance; this produces painful, unequal, and spasmodic contraction, not only distorting the limb, but causing it to contract. Let me illustrate this by a familiar example:—A person has on a tight boot, which pinches a toe, or irritates a corn when he attempts to walk; the muscles of the leg will act unequally in order to relieve the injured part from pressure, and prevent the foot's being applied equally to the ground. Thus the harmony of muscular action is destroyed, and in a short time the person will discover that the muscles of the leg and thigh are excessively sore, and prone, when he sits or lies, to painful spasm. So also, when one sleeps in a posture that is painful, or on a hard support, the soreness which he afterwards experiences in the muscles, is not owing so much to the pressure which they may have suffered, as to the efforts which they have made to relieve certain parts from pressure. It will be found that the limbs of a person who sleeps thus, will by no means repose so tranquilly as on a soft bed; all the muscles of the body will be found, in some degree, in the same state of involuntary tension that they are in when we are sitting or standing. Just so is it with the fractured limb, which does not repose with perfect ease on its support.

There is another evil w ich results from this injuri-

ous pressure. Whenever there exists a fracture, and irritation is inflicted upon any part of the limb, however remote it may be from the seat of injury, it will immediately excite irritation there, and under such circumstances all the unpleasant effects that are the result of irritation will follow. The patient also is made exceedingly restless by the pain and fever which is produced, and distorts the limb by the motions of his body.

If the whole weight of the limb rests upon but two or three points, the softest cushions that can be used will have but little influence in preventing mischief.—A down cushion is easy only because it becomes spontaneously concave when the member is laid upon it, and because it diffuses the pressure over a considerable surface; but it cannot apply itself so extensively to the surface as a concave, well adapted splint can, nor can it give so easy support, because those parts which first touch the cushion will suffer the greatest pressure.—Besides, cushions cannot be made to sustain a limb equally from one extremity to the other, consistently with the support which the limb must receive from the splints and bandages. Hence, then, the advantage of making the splint at the same time the bed of the limb. Soft supports also create too much heat around a limb.

All the ordinary modes of treating fractured thigh are liable to the inconveniencies to which I have alluded. The limb receives unequal support, the greater part of the weight being often thrown upon the heel, or upon some part which is sustained by a band that lashes it to a side splint, instead of reposing on a well adapted surface. It is no evidence, because this pressure cannot at first be felt, that it will do no mischief. The pressure

of the soft point of the finger, if continued sufficiently long upon a part, would cause sloughing. The pressure on the soles of the feet, produced by standing, well as the part is fortified by cuticle and adipose substance, can be endured but for a few minutes without pain.—When we stand we are constantly shifting from foot to foot, but let any one bear the weight of the body on one foot for a few minutes and the pain becomes insupportable. Much more will this be true in regard to parts which were never designed to sustain such pressure.—Now the splint which I recommend is designed to be adapted to almost the whole inferior convex surface of the entire limb. The thigh drops snugly into the concavity of the upper splint, and reposes upon it with perfect equality. The leg, at the upper part, rests on one of the cross bands—the calf lies in the hollow of the splint, and the ankle is supported on another sling; while the heel, which is least capable of enduring pressure, is not suffered to touch. The hardness of the splint by no means renders it a less easy support. As I remarked before, the softest cushion is easy only because it diffuses the pressure over a considerable surface. Iron would be easier than down if the surface could be accurately adapted, and its relative position could be maintained.

2. The next indication is to place the limb in the easiest attitude, and to obviate, as completely as possible, the unequal action of the muscles. The very excellent observations of Mr. Pott on this subject have, in my opinion, never been superseded, although a practice hostile to them has been very generally adopted.—He says with truth, that the semiflexed posture of the

thigh and leg is the easy attitude into which the member is always thrown for repose, and in which the muscles are most uniformly relaxed. When the leg is perfectly extended on the thigh, it is obvious that the muscles on the back part of the thigh are as perfectly extended as they can be, and those on the anterior part as perfectly relaxed. It is true that the extension of the thigh on the pelvis in the straight position, will relax the posterior muscles a little, and in the same degree extend those behind, but this will by no means be sufficient to counteract the effect produced by the perfect extension of the leg on the thigh.

When muscles are unequally extended, they will seek to relieve themselves by voluntary spasmodic efforts. The limb, in regard to some of them, is elongated, and they will endeavor to make it shorter. Now it is infinitely better and easier to prevent the occurrence of this, by placing the muscles in such harmonious relation that they will be equally at rest, than it is to counteract it by the permanent extension, which then becomes necessary. Those can easily appreciate the value of this precept, who have witnessed the torture and frequent inefficacy of the permanently extending apparatus. Even should extension be necessary, it will be effected with far more ease when the muscles are in harmonious relation. But I am perfectly certain that the necessity for permanent extension is often produced by the mal-position of the limb, and the irritation excited by badly adjusted splints and supports.

3. The next circumstance necessary to the secure position of a fractured thigh, is the accurate support of both the leg and foot in such a manner that they shall

not operate as levers to throw the lower fragment out of its proper relation to the other. The weight of the leg operates with great power on the inferior fragment of the broken femur, and it is mathematically demonstrable that no force which can be applied to the sides of the thigh itself, can act with sufficient power, through the medium of the muscles, on the fractured extremities, to antagonize in any degree the tendency to displacement. The leg, therefore, must be carefully sustained, not merely by cushions and bolsters, for these are perpetually undergoing displacement, but by something which shall give uniform, unyielding, and yet easy support. That it may preserve the leg in a proper attitude in relation to the thigh, it must be securely fixed to the thigh-piece. The weight of the foot, when that organ is unsupported, tends to rotate the leg and thigh outward, or inward,—the more so when the weight of the bed-clothes is added to it. This force is not great, but the constant operation of it, if not obviated, is certain at length to produce this result. Now the support of the leg and foot, by the apparatus here described, appears to me to be perfect. The firmness of the leg-splint, and the immobility of it on the thigh-piece, when the angle is fixed, render it impossible that it should drag upon the lower fragment of the femur.—The foot is sustained with equal effect by the very simple turns which are made with the bandage round it, and round the extremity of the apparatus.

4. It is equally important that every apparatus for fractures of the thigh should be secured to some part of the body, that, if the body moves in any degree, and it is impossible that it should not, the whole apparatus

may move in correspondence with it; otherwise, when the body moves, it will drag with it the upper fragment of the femur, leaving the other fragment and the leg, attached to the splint, in its former position. But if the splint is secured to the body, then, whatever movements of the latter may take place, the limb maintains the same relations, and the fracture is undisturbed. From this, too, it must be obvious that a light splint, neatly adapted, and which readily accompanies the slight involuntary movements of the body, is far preferable to a cumbrous apparatus, which is so fixed to the bed, and so heavy, that it cannot move. Hence also the twofold objection to the apparatus of Mr. Charles Bell, as it is commonly employed in this country.

The apparatus which I recommend is firmly secured by the hip-piece to the side of the body, so that when the latter changes its place, the splint moves in correspondence with it. Its lightness, also, and its convexity, where it rests upon the bed, are circumstances which conduce to the same result. But when I wish to make it even more perfect in this respect, I sling up the lower part of the splint, so that it may not touch the bed. Then, if the patient slides down in the bed a little, instead of crowding one fragment down upon the other, the whole splint and limb will instantly move in correspondence, nor meet with the slightest resistance; and so in all other movements.

5. Another excellence belonging exclusively, I believe, to this apparatus, is the complete security of the limb, when reposing in the hollow of the splint, even though no bandage be applied, except to bind the hip-

piece to the side of the body. The bandage is only necessary for the purpose of sustaining the foot and giving firmness and strength to the apparatus. It also adds to the security of the member during sleep. But even when the bandage is applied, it will be observed that the limb is no where ligated by any strap, band, or bandage, the use of which is now pretty generally admitted to be injurious. The bandage being on the outside of the splint, the limb can no where be unequally constricted by it—the sides of the apparatus are merely compressed upon the limb. That the limb will swell more, if a bandage be not directly applied to it, is a lost fear—we may obviate it far more effectually by elevating the lower extremity of the splint.

There is scarcely any more prolific source of mischief in the treatment of fractures, than the direct application of bandages. Many years ago they were snugly applied at the place of fracture, for the purpose of moulding the callus, and shaping the new-formed bone. More recently, they have been used because our fathers have done so before us, and because they are supposed to obviate swelling. But I am persuaded that their effect is directly the opposite—it certainly is, whenever a bandage does not act with perfect equality, and I defy the most skilful dresser, to apply a bandage to a member varying in size from day to day, that shall not constrict it unequally, unless it be frequently reapplied; and this is impossible, without greatly disturbing the injured member. In some modes of dressing, in which bands are firmly applied to the neighborhood of the fracture, it becomes necessary to apply bandages below, to prevent the mischief which might result from its being bound but in one place.

All bands which press upon fractured limbs for the purpose of tying them to the supporting splints, do more or less injury. If possible, the weight alone of the member, sinking it into its bed, should maintain its proper form, and this is the case in the apparatus above delineated. There is no necessity here that the surgeon should perpetually watch for the relaxation of a band, or the displacement of a piece of the splint—nothing, which is necessary to the security of the limb, can give way.

Another great advantage consists in the facility with which the limb may be examined without the necessity of relaxing any part of the apparatus which gives support to the member. Indeed, as the bandage can be removed without inflicting the least pain, it will often be found salutary to remove it every day, and to use gentle friction upon the limb with the hand.

6. This apparatus is especially applicable to the treatment of compound fractures. It is so, first, because of the uniform and easy support which every part of the member receives; and, secondly, because it is so easily accessible. Even should the wound in the soft parts exist on the inferior part of the thigh, nothing is easier than to cut away a portion of the walls of the apparatus, opposite to the place of injury.—This will enable us to dress it with perfect facility.

7. In cases in which it becomes necessary to employ permanently extending force, (and I believe that they are not numerous when this apparatus is used,) nothing can enable us, as it appears to me, to accomplish it with more ease than this. In the first place, there is always a gently extending effort made upon the

thigh, from the attitude in which the member is placed. The thigh is placed on one inclined piece, and the leg upon another; the leg, therefore, inclines to drag in one direction, and the thigh in the other, by their own weight. The leg will act on the lower fragment of the thigh to prevent its following the other, which sinks toward the bed.

But when a more powerful effort is required, the leg-piece must, as we have before described, be separated from that of the thigh, brought lower, and again fixed. This has the effect of elongating the thigh-piece. The leg cannot slide upward, because of the manner in which it is sustained by the slings and bandages. We may also have the foot fixed to the extremity of the leg-piece.

The counter-extension is made with peculiar advantage, because it is effected by nearly the whole cushioned margin of the upper splint, applying itself very extensively to the perinæum, to the tuberosity of the ischium, and to the trochanter, diffusing its pressure extensively over the surface.

8. Another excellence which I claim, is the facility with which the angle of the apparatus is varied, the member being more or less flexed or extended. A little variation in this respect sometimes gives great relief, when a uniform attitude has become tiresome.—This also renders the apparatus peculiarly useful when an injury has occurred in the vicinity of the knee joint, and when, after union is supposed to be taking place, we wish to prevent anchylosis of the joint by gentle flexion and extension.

REMARKS

ON

DISLOCATIONS OF THE HIP-JOINT.

BY N. R. SMITH, M. D.

(The principles which, in the following pages, I shall endeavour to establish, relative to the reduction of the dislocated Os Femoris, were in part derived from my father's lectures. The discriptions and illustrations are altogether my own. I shall not endeavour to furnish a complete treatise on these dislocations, but shall refer the reader to the systematic works for the common doctrines and methods of practice. That which I hope to present is designed to be supplementary to the information which we now possess, and to subvert certain erroneous practices. I shall presume the reader, therefore, to be acquainted with the anatomy of the hip-joint, the varieties of dislocation which there occur—their symptoms, and common modes of treatment. Some circumstances, however, I shall recapitulate.

N. R. S.)

Great violence is not always necessary to effect the dislocation of even a very strong articulation. It is effected by *peculiar* violence, so applied as in a degree

to evade and render useless the common defences and supports of the joint, and so operating on the bone about to be dislocated, as to multiply itself by mechanical advantage. It is peculiar, too, in the manner in which it co-operates with the muscles, throwing the member into such an attitude that these organs are compelled to aid in effecting the mischief, although, in their harmonious action, they contribute greatly to the security of all important articulations. It provokes those muscles also to spasmodic—preternatural efforts.

The accidental forces which effect the dislocation of the hip-joint generally operate on the inferior extremity of the femur, either directly, or through the medium of the leg. The thigh-bone thus becomes a lever, on the long arm of which the violence acts with great effect. When violence acts on the bone in the directions in which it is flexed and extended, no mischief results; because, by its freedom of motion, the member evades it, and because, too, those motions of the thigh are the most secure, they being accomplished by a mere rotation upon the axis of the head and neck, the most free and the most secure motion which can occur in a ball-and-socket joint. It is in effecting the motions of adduction and abduction, that violence inflicts injury upon this articulation. A moment's attention to its structure and motions must convince the reader that neither of those movements can be carried far, before the apparatus of the joint becomes violently strained. Abduct the thigh to some extent, and immediately that portion of the capsular ligament which is below the joint, is put upon the stretch, and is operated upon by a prodigious force, because of the length of the lever. At the

same time, the upper part of the neck of the bone is checked upon the upper border of the acetabulum.—Motion in that direction must then cease; but if the effort be continued, and with violence, the bone becomes a lever of the first kind—the power operating at its inferior extremity—the fulcrum being the point where it checks upon the upper margin of the acetabulum—and the head of the bone being the point of resistence.

The abducting violence will then lift the head of the bone, with great force, from the acetabulum, and will press it against the inferior part of the capsular ligament. This being already violently stretched, at length bursts, and the head of the bone is protruded through it.—While this violence is being inflicted upon the joint—destroying its defences upon the inferior side—the extreme degree of abduction which will have been produced, painfully extends and irritates the muscles which perform the office of adduction, and others which are inserted into the inner part of the thigh. The whole extent of the triceps adductor will be violently put upon the stretch; so also will be the pectineus—the obturator externus—the psoas magnus, and the iliacus internus. The force with which muscles, under such circumstances, involuntarily contract and struggle to relieve themselves from their painful condition, is truly astonishing. They are threatened with laceration, and all their contractile power is brought into exercise to resist it. The effort of these organs is similar to the violent cramp which occasionally seizes on an individual muscle, producing so powerful a contraction that several muscles of equal size are not able, by a volun-

tary effort, to antagonize it, and the limb becomes distorted.

Now this powerful contraction of the muscles tends directly to drag the head of the bone downward and forward into the thyroid hole, or forward and inward upon the body of the os pubis. This it is undoubtedly capable of accomplishing, and in most cases does accomplish, without direct aid from the external violence, which may be concerned merely in the violent abduction. Such violence may, however, sometimes conspire to produce the same result; for, at the same time that it forcibly abducts the limb, it may strike a blow upon the knee in the direction of the shaft of the bone. But I am persuaded that dislocations would very rarely take place but for the co-operation of the muscles. Let any one who doubts this position attempt the dislocation of a large joint upon the dead subject. My father once directed his pupils to dislocate the hip-joint in the dead subject, in order that he might illustrate the method of effecting its reduction. Every mechanical expedient which could be devised was in vain put in requisition for this purpose, and the attempt was abandoned. I have in the same manner been foiled in attempting the dislocation, in the dead subject, of joints less strong than the hip.

The violent adduction of the thigh effected by force which impels the knee directly inward beneath the pelvis, inflicts the same injury upon the upper portion of the capsular ligament. In the same manner also the head of the bone is lifted from the acetabulum, and raised upon the upper border of the cup. By the great degree of adduction which will have been produced

before this occurs, the abductor muscles (the glutei,) will be most painfully extended, and will be provoked to the most powerful spasmodic contractions. It is the struggle of those muscles which, in most cases, then drags the bone from its place and effects a dislocation upward and backward on the dorsum of the ilium. That the effort of those powerful muscles is adequate to the effect is perfectly obvious. The effect which they produce when acting in the ordinary exercise of their functions, although they act on the femur as a lever of the third kind, and under every mechanical disadvantage, is very great indeed. But here they spend all their force in a direct effort on the joint, not only to effect displacement, but to aid in producing the laceration of the ligament.

So active a part do muscles perform in effecting dislocations, that not unfrequently they alone, when convulsively acting, luxate important articulations. Dislocation of the shoulder, in a paroxysm of epilepsy, is a thing of very frequent occurrence. The hip also is sometimes dislocated at the moment of the production of very slight distortion, by the action of the powerful muscles concerned in the motions of the femur.

I am satisfied, from both observation and reflection, that the accidental violence which effects the dislocation of a joint, in most cases, does little else than violently bend the member, lacerate the ligaments on one side, and provoke the unequal action of certain muscles. The final distraction of the bone from its natural position, I believe to be in almost all cases effected by the action of muscles alone. This I confidently infer from the manner in which I have known violence to

effect the dislocation of bones. I am persuaded, also, that violence can scarcely act in any other manner; for, when a blow is struck upon the extremity of a bone, the joint is not endangered till the bone is violently bent —distorted; and in becoming so, the member necessarily evades in a great degree that part of the force which operates in the direction of its length, and feels that chiefly which violently bends the joint.

If the muscles are thus actively concerned in effecting the dislocation of joints, and especially the hip—if they so generally exercise the final effort which drags the bone from its place, does not this indicate that the action of muscles may be made powerfully subservient to the replacement of the dislocated bone? Does not this render it probable that, by moving the member in a direction counter to that in which it may have been bent at the moment of the occurrence of the dislocation, we may compel the muscles which are the antagonists of those which effected the displacement, to throw the head of the bone in the opposite direction, and thus to effect its reduction?

By grasping the distal extremity of the dislocated bone, and making bending movements like those which violence employs in producing dislocations, we have it in our power to call into exercise, with great effect, certain muscles attached to the bone. We do this with great mechanical advantage, because we use the bone as a lever, on the long arm of which we impress our force. The muscles which we wish to put upon the stretch are inserted near the head of the bone, and they represent the fulcrum. The head of the bone is the point of resistence.

Thus; if the hip be dislocated upward and backward, and we grasp the knee and powerfully abduct the member, we put powerfully on the stretch the abductor muscles. The power which we exercise on them is very great, because the thigh-bone is the long lever which multiplies the force. Those muscles, then, will be called into the same kind of powerful, convulsive action which occurs in those muscles that cause the dislocation. But now the muscles drag the head of the bone directly toward its natural position. They may certainly be supposed to do it with as much effect as that with which the others drew it from its natural relations, for it is impossible that the head of any bone should be so securely and firmly fixed in any position, after it is dislocated, as it is in its natural socket before dislocation. Hence the muscles, if their action be employed to the best advantage, will more easily draw a bone back into its natural place, than from it. To cause certain muscles thus to act, the limb must be bent in such a manner that they alone, if possible, shall be strained by the movement.

That muscles do thus powerfully co-operate in the reduction of dislocated bones, is manifest from what occurs when the replacement is effected. When we use the ordinary methods of reducing a bone, at the moment that it returns to its socket, we usually hear a distinct snap. We also feel a concussion, or jar of the member, at the same time. It is this which generally announces to us that we have succeeded in our attempt. Now, these phenomina are owing to the quick and energetic effort with which certain muscles pull the bone into its place, as soon as the limb is placed in an attitude to favour their action.

Although great force may have been exercised in effecting the dislocation of the hip-joint, it does not necessarily follow that an equal degree of violence must be used to replace the bone. Although the reduction of the femur is undoubtedly more difficult than that of any other dislocated bone, yet the object is sometimes accomplished with a very slight effort, provided it be used with tact and mechanical ingenuity. Dragging efforts might be made upon the limb till it should be almost torn from the body, and the reduction would not be accomplished, unless such movements of the limb were made as should favour the action of the muscles, and throw the head of the bone towards its socket.—It has often occurred, in the dislocation of this as well as other articulations, that after very powerful efforts have been made in vain, under apparently the most favourable circumstances, an accidental movement of the limb, made with little force, but in a manner to favour fortuitously the efforts with which nature is disposed to co-operate with our endeavours, has, in the most unexpected manner, at once accomplished the reduction. A case (which, however, I am not at liberty to relate) fell under my observation, in which the most powerful and persevering efforts were made by the aid of pullies, but without success,—made, too, by men of science and skill. The case was then dismissed as unmanageable. In a few hours the patient fell into the hands of a quack, utterly ignorant of the anatomy of the joint, and of the nature of any of its dislocations. He, however, without any assistance, and with merely the effort of his own hands, moved the knee in a careless manner in various directions, when, to the astonishment

of himself, no doubt, as well as others, an audible snap was heard, and it was discovered that the bone was at once reduced.

Every one is familiar with the memorable case related by Mr. Cornish, a respectable surgeon of Falmouth, Eng., and recorded by Sir A. Cooper in his valuable Treatise on Dislocations, page 80. The patient, McFadder, a seaman, had suffered a dislocation of the head of the os femoris upward and backward on the dorsum ilii. Repeated attempts were made by Sir Astley Cooper and other surgeons, at various times, to effect the reduction, all the adjuvant means—bleeding—warm bath—nauseating medicines &c. being called into requisition. It is to be presumed that the pullies were employed in the usual way, although this is not distinctly stated. At all events, the case was abandoned as utterly hopeless.

Twelve months after the accident, Mr. Cornish saw the man, examined the hip, and saw all the evidences of a dislocation of the femur on the dorsum ilii. Several years after this, he again saw the patient, and, to his surprise, the bone had in the mean time been reduced. It had been effected by accident, five years after the dislocation. The man had suffered a fall, in which a blow was inflicted upon the member, and instantly all deformity disappeared and, from that time, he threw away his crutches. Here the reduction must certainly have been immediately effected by the action of the muscles alone; for, although the limb may have been powerfully bent at the time, yet there was none of the extending effort made upon the limb which surgeons employ in effecting the reduction. The lateral move-

ment of the limb, in this case, could have done nothing more than to throw the member into an attitude favourable to the action of the muscles.

In the first volume of Dorsey's Surgery, page 242, a very pertinent case is related as having occurred in the practice of professor Physick. The fact is the more valuable, as coming from the hand of one unequalled among us in judgement and skill.

In a case of dislocation of the femur directly backward, after very powerful efforts had been made to effect the reduction by extension, professor Physick, conjecturing that the head might be confined in a slit of the capsular ligament, discontinued the extending force entirely, and then, with no more force than that of his own hands, abducted the thigh, when the bone instantly slipped into its place. Here certainly the abduction (although there was some pressure made upon the head of the bone with the hand) could have done little more than place the limb in a favourable attitude for the action of the muscles. The operator appeared to think that the impediment to the reduction by extension arose from the bone's being confined by the button-hole rent. Sir A. Cooper does not believe that such an impediment can ever occur, and, from the magnitude of the head—the shortness of the ligament &c. I am persuaded that this is correct. At all events, the operator succeeded by an effort much more gentle than is usually deemed necessary, even when there is supposed to be no unusual impediment.

Dr. Dorsey remarks that "in all difficult cases it will be proper to try every possible motion of the limb before abandoning the case as hopeless; very often, after great

force has failed, a gentle effort in some new direction is found successful."

But if these gentle efforts—these experimental bending movements of the limb, so often succeed in the worst cases, and after the most powerful efforts have been made in vain, does it not go far to prove that gentle means, if adroitly employed, would succeed better in all cases?

There is, no doubt, a constant mechanical principle upon which the reduction is effected in such cases, and one which would perhaps succeed in nearly all cases, if we knew how to employ it understandingly, and with precision, and did not avail ourselves of it by mere hap-hazard. If a gentle movement of a peculiar kind succeeds in one case of complete dislocation on the dorsum ilii, after all other means have failed, ought not this movement, if well understood, to succeed in other cases better than the usual mode. The mechanism of these dislocations is certainly the same in all of this variety—the bone assumes the same attitude, and the muscles assume the same relations—furnishing the same impediments, and the same aids in every case. This frequent failure of art, and the success of accident, satisfy me that there is some important principle relative to the mechanism of these dislocations, which is not yet understood. Accident ought not to accomplish the reduction of a bone with more ease than art. When it does so, such accident should be our instructor, and teach us the mechanism by which it operated, and this we should repeat in similar cases.

Mode of applying force in the reduction of dislocations of the hip.

The propriety of employing pullies for the purpose of multiplying power in the treatment of dislocations of the hip, appears to be so tacitly and universally admitted, at the present time, that one who contends against it can scarcely expect to obtain a favourable hearing. But the facts which I have stated above, and the inferences which they justify, are certainly hostile to their general employment. If it be important, as I have endeavoured to show, that during the attempt, the attitude of the member should be so varied as to favour the action of those muscles which are so important in aiding to effect the reduction, then certainly there is to be deduced from this a strong objection to the use of any mechanism which precludes the possibility of taking advantage of the action of the muscles. While powerfully extending the limb with pullies, it is obvious that no bending movements by which we use the bone as a lever to throw the head into its place and call the muscles into action, can be employed; the effort must be made in one undeviating direction. In the use of the pullies, also, we are compelled to extend powerful muscles, the resistance of which can, by a method hereafter to be pointed out, be completely evaded by a little address in the movements of the limb.

Thus, when, in a case of dislocation on the dorsum ilii, we endeavour to effect the reduction of the bone by extension made by pullies from the knee or ankle, the extending effort which we then make is directly resisted by the glutei muscles, the most powerful in the

Lith. of Endicott & Swett.

body. Indeed, the reduction can not be effected by dragging the limb directly downward in this manner, without putting them violently upon the stretch, because, before the head can be returned to its place by this movement, the trochanter, where the muscles are inserted, must be carried far outward from the pelvis at the moment that the head mounts over the margin of the cup, and also downward as low as its usual attitude, and thus will the points of origin and insertion of those muscles be widely removed, and they of course rendered very tense. But could the thigh be abducted at the moment that extension is being made, it is apparent that the trochanter would be thrown upward at the moment that the head descended, and thus would the points of origin and insertion be approximated, and the muscles relaxed, while at the same moment the adductor muscles, which aid the reduction, would be called powerfully into exercise. Indeed, it is obvious that, in effecting the reduction of this dislocation by pullies, nearly all the muscles which are inserted into the thigh-bone are violently strained, and in such a manner that they resist with great effect.

When we have effected, by the force of the hands, a partial approximation of the head of the bone to the socket, we find that the business is suddenly taken out of our hands by the contraction of the muscles, and the bone springs into its place with an audible snap, and we feel a shock—an impulse given to our hands by the effort of the muscles. Now this can not so readily occur when the pullies are employed, because the limb is too rigidly fixed;—the pullies furnish an unyielding, inelastic force which will not yield the limb to the action

of the muscles, which, if they had command of it, would throw the dislocated extremity home. They perhaps make spasmodic efforts, during the extension, to effect this, but they are foiled by the resistance of the pullies, and as their effort can not persist long, it accomplishes nothing.

The pullies rarely succeed in the reduction of this dislocation, without the employment of vene-section, and other means to effect the relaxation of the muscles, and the violence employed is necessarily such that often alarming prostration results. It is impossible to estimate correctly the degree of force which we employ with the pullies.

Lastly, the pullies, exercising great power, are often employed without effect in cases in which, subsequently, very gentle force, employed with address, as by professor Physick in the case to which we have alluded, or accidently, has accomplished the reduction with the greatest facility.

I am not, however, prepared to say that the pullies may not sometimes be useful. Perhaps by placing the patient on a revolving table, and fixing him securely to it, the direction in which they operate might be so varied that the lateral movements of the limb might be made, consistently with extension by these machines. I at present incline to the belief, however, that they might be altogether dispensed with.

Proposed method of effecting the reduction of the os femoris, dislocated upon the dorsum ilii.

Professor Nathan Smith used to relate, in his surgical lectures, a case of dislocation of the os femoris on the dorsum ilii, in which he promptly succeeded by the

mere force of hands, in effecting the reduction. Notes of this case unfortunately I am not able to discover among his papers. The principal facts, however, are fresh in my memory, and will undoubtedly be borne in mind by many who have listened to his instructions.

After attempting the ordinary methods by extension, in vain, he bent the leg upon the knee, seized the leg, and using it as a lever, rotated the thigh a little outward. Then he gently abducted the thigh, and lastly flexed it freely on the pelvis, by carrying the knee toward the face of the patient. These movements instantly succeeded, and with but little effort of strength.

A medical gentleman of Massachusetts, who had been a pupil of my father, saw a similar case of dislocation—practised the same method, and succeeded with equal facility. A letter from him to professor Smith, detailing the particulars of the case, I once saw, but unfortunately it cannot now be found.

The case quoted above, in which professor Physick succeeded in effecting reduction by a gentle abduction of the thigh, was one of dislocation backward, behind the posterior border of the acetabulum. The case in which my father succeeded, was one of dislocation on the dorsum ilii, and he accomplished the reduction by a compound movement. The free flexion of the thigh forward on the pelvis, would have the effect, by calling into exercise the gluteus maximus, to throw the head of the femur downward, behind the border of the acetabulum, precisely in the position in which it was fixed in professor Physick's case. The rotation of the thigh outward, and the abduction of the member must, as can be anatomically demonstrated, have thrown the head of

the bone forward into the acetabulum. When the bone is dislocated on the dorsum, the trochanter is dragged forward, the femur rotated inwards, and the head and neck of the bone are applied flat-ways on the pelvis, as is represented in fig. 1 of the plate. The rotation of the limb outward would, therefore, throw the trochanter outward, and cause the head to present in an attitude favourable to its entrance into the acetabulum.—The abduction of the bone at the same moment, would have the effect to call powerfully into exercise the adductor muscles which come from the anterior part of the pelvis, and are inserted into the linea aspera. The strong effort of these muscles will necessarily tend, when this movement is made, to drag the head of the bone directly forward and downward into the acetabulum. If we consider these muscles to represent the power, the hand of the surgeon (abduction being completed) applied to the knee, will be the fulcrum, or centre of motion, and the resistance is at the head of the bone. The adductor muscles will then act on a lever of the third kind, but, acting near its extremity and nearly at right angles to it, will exercise a power far greater than muscles ordinarily do—far greater than those muscles themselves do in the ordinary exercise of their functions. The effect of their contraction, then, as they will be much excited, must be very great, in aiding the reduction.

If, while abduction is being made, we regard the hand of the surgeon at the knee as the power, then do the tense abductor muscles furnish the fulcrum, and the head of the bone, the resistance. The power exercised by the surgeon then operates upon far the longest

arm of a lever of the first kind, and therefore with great mechanical advantage, in throwing the head of the bone toward the acetabulum.

It should be particularly noticed that, while this compound movement of the bone thus calls into exercise, with their utmost power, the muscles which aid the reduction, it most effectually relaxes those (the glutei) which tend to resist it, and which were instrumental in effecting the dislocation. It will be observed that these, as well as all the other muscles inserted into the upper portion of the bone, must powerfully resist when the reduction is attempted by direct extension. Two very important objects then are at once accomplished; 1st, we call the adjuvant muscles most powerfully into exercise; 2d, we effectually avoid the resistance of those muscles, the action of which is by all surgeons regarded as the chief impediment to the reduction of all difficult dislocations.

As I before remarked, the cases in which lateral movements with gentle force have succeeded, either by design or fortuitously, in promptly reducing dislocations which have resisted more powerful means, induce me to believe that there is a secret method in which we may uniformly thus succeed; and that method I believe to be the one in which the movements described above are employed. This I infer from facts which I have stated, and from the anatomical mechanism of the joint and appendages.

The practical precepts derived from the above, are concisely these. The patient being prepared for the operation by whatever means may be deemed necessary, may be placed in an attitude convenient for the opera-

tion with the body securely fixed, by placing him in the horizontal posture, on a narrow table covered with blankets, and on the sound side. To the table his body should be firmly fixed, and this can be conveniently done by folding a sheet several times, length-ways—then applying the middle of the broad band thus made to the inner and upper part of the sound thigh—carrying its extremities under the table, crossing them beneath it, and then carrying them obliquely up and crossing them firmly over the trunk, above the injured hip.—The ends may then be secured beneath the table. To support the trunk the more firmly, a pillow may be placed on each side of it upon the table, and be included in the bandage. Should the operator design to employ any degree of extension, a counter-extending band may be placed in the perinæum, and carried up to the extremity of the table, be fixed to some more firm body, or held by the hands of assistants.

The operator now standing on the side to which the patient's back presents, grasps the knee of the dislocated member with his right hand, (if the left femur be dislocated—vice versa, if the right) and the ankle with the left. The first effort which he makes is to flex the leg upon the thigh, in order to make the leg a lever with which he may operate on the thigh-bone. The next movement is a gentle rotation of the thigh outward, by inclining the foot toward the ground, and rotating the knee outward. Next, the thigh is to be slightly abducted by pressing the knee directly outward. Lastly, the surgeon freely flexes the thigh upon the pelvis by thrusting the knee upward toward the face of the patient, and at the same moment the abduction is to be increased.

Professor N. Smith regarded the free flexion of the thigh upon the pelvis as a very important part of the compound movement. He believed that it threw the head of the bone downward, behind the acetabulum, where the margin of the cup is less prominent, and over which, therefore, the adductor muscles would drag it with less difficulty into its place.

The operator may slightly vary these movements, as he increases them, so as to give some degree of rocking motion to the head of the os femoris, which will thereby be disengaged with the more facility from its confined situation among the muscles.

Should the operator deem it necessary to conjoin extension with these efforts, a band may be attached above the knee, in the usual manner. With this, extension is first made horizontally—in the direction in which the bone presents. Then it is directed a little outward, so as to favour the necessary rotation and abduction. Lastly, it is made in a direction obliquely upward from the table, in order to favour the flexion upon the thigh. This last extending effort may be made by an assistant standing on the table, near its foot, with a band thrown round his neck and shoulder, and attached to the limb in the usual way. When the head of the bone is supposed to be approaching the cup, an assistant may press with his hands firmly upon the trochanter, downward and forward, toward the acetabulum, thus aiding the effort of the muscles.

When the femur is dislocated backward into the ischiatic notch, abduction seems to be the only movement which is necessary, since the head of the bone is already behind the acetabulum. This was precisely the move-

ment with which professor Physick succeeded in such a case.

Of the other less difficult varieties of dislocation of the femur, it has not been my present purpose to treat.

Description of the Plate.

Fig. 1, represents the attitude of the femur when dislocated upward and backward on the dorsum ilii.

Fig. 2, represents the attitude of the bone when its rotation outward has been effected, in the attempt to reduce it.

Fig. 3, represents the bone when rotation, flexion on the pelvis, and abduction being all performed, the head of the femur is mounting over the margin of the cup.

REMARKS

ON THE

RADICAL CURE OF HYDROCELE,

BY THE

EMPLOYMENT OF THE TENT.

BY N. R. SMITH, M. D.

Professor N. Smith, at different periods, practised various methods of radically curing hydrocele. At one time, he practised the method of Hunter—at another, that of Mr. Pott, with the seton—subsequently, he used the various injections. At length he fixed upon the employment of the tent, as that which he learned by experience to regard as the safest, most certain, and least painful method—also that which is performed with most facility.

He was opposed to the injection of wine, because he regarded it as not altogether safe. He observed that, notwithstanding the precautions which are abundantly given in all works on surgery, and although the operator may be fully aware of the hazard, yet it still occasionally happens that the fluid injected, in consequence of the pipe getting disengaged from the tunica vaginalis, is thrown into the cellular tissue of the scrotum, and extensive sloughing is produced.

I was myself once conversing with a very intelligent medical gentleman on the subject of this operation, and advocating the use of the tent, while he expressed a decided preference for the injection. He remarked, that he could not conceive how any accident in this mode of operating could occur, in the hands of one aware of the danger to be guarded against. The very next day, he performed the operation, and, in consequence of some defect of his instruments, or the awkwardness of an assistant, threw the wine into the whole tissue of the scrotum. The result was so extensive a sloughing of the parts, that the testes were left completely exposed, and suspended merely by the spermatic cords.

It was the occasional occurrence of such accidents, although this never happened to himself, that induced Professor Smith to reject this mode of operating, and to use exclusively the tent.

In the employment of the tent, he considered that, in the first place, there was no possible danger;—also that the method is more simple, requiring a less complicated apparatus of instruments. He found, too, that the desired result was more certain to take place; because, not knowing the precise degree of sensibility in the tunica vaginalis, we cannot accurately adapt the strength of our injection, and therefore we sometimes stimulate the parts not enough----sometimes too highly. But in the use of the tent we can leave it in the tunica, until the necessary degree of excitement is produced.

Professor Smith's method of executing the operation was the following. Having shaved the scrotum, he grasped it with his left hand, in such a manner as to render the

integuments tense, being careful, however, not to suffer them to glide upon the subjacent parts. With a lancet in the right hand, he then incised the integuments, with the shoulder of the instrument, to the extent of two inches, on the anterior and inferior portion of the tumour, dividing the cellular tissue carefully down to the tunica. This being done, he struck the lancet into the membrane, and ripped it up, to the extent of three fourths of an inch. Then, while the water was gushing from the orifices, he introduced into the tunica a probe, bent so as to form a hook. This was very necessary, in order to preserve the parallalism of the external and internal cuts, as the integuments glide freely, and often entirely conceal the internal incision, and render it very difficult to recover it. Holding the orifice with the probe, he took from an assistant another probe, over the end of which a narrow slip of linen was folded. This slip of linen, he conveyed, with the probe, to the bottom of the tunica, and then pinching the integuments upon the tent, he withdrew the probe, leaving the linen slip in that situation. The usual dressings were then used, and the tent left generally till suppuration ensued, but removed earlier if too much irritation resulted. This method, in his hands, was successful almost without an exception.

The method now most approved in France, is with a species of tent. M. Dupuytren introduces a portion of a catheter, and, by means of threads attached to its extremity, fixes it in its place for the requisite time. The piece of catheter answers the double purpose of a tent, and a conductor to convey off the water, which still continues to accumulate for a time,

and which is said sometimes to defect the adhesion of the tunica, by distending the sack. The only difficulty in its use consists in confining the catheter, as, from its smoothness, it is liable to slip out. This I have effectually obviated, in one case in which I have used it, by securing to the extremity of the instrument a small piece of dry sponge. This, when introduced, becomes expanded—holds the catheter securely, and, coming in contact with a more extensive surface, excites more irritation. It is preferable to the common tent, on account, also, of the danger of pulling out the tent, when the probe, with which it is introduced, is withdrawn. In the case in which I used this apparatus, I was exceedingly pleased with it.

REMARKS

ON THE SPONTANEOUS SUPPRESSION

OF

HEMORRHAGE,

With Comments on the Physiology and Pathology of the Circulating System.

The very popular treatise of Dr. Jones on the process employed by nature in suppressing hemorrhage is, I believe, still regarded as a sufficient and satisfactory explanation of the phenomena of which it treats. In surgery his deductions are, I believe, generally received as principles, and his opinions quoted with confidence; nor am I aware that they have been controverted by any recent author.

If, as I believe, I correctly understand the general conclusions of Dr. Jones, the causes which he assigns for the spontaneous suppression of hemorrhage, in cases of divided arteries, are purely mechanical, that is, the blood does not cease to flow by the cessation of any vital action in the artery, but is suppressed by physical obstacles which result from the division of the artery and the wounding of contiguous parts. He mentions, indeed, the vital action of the artery, but he

supposes this to employ mechanical means for accomplishing the effect.

In treating of the pathology of the arteries, Dr. Jones, and others who have discussed this subject, regard the propulsive power of the heart as the sole cause of the effusion of blood, not taking into account any independent vital action of the artery itself as influencing the current of that fluid.

The first cause which Dr. Jones has assigned for the spontaneous suppression of hemorrhage, in cases of divided arteries, is a contraction of the wounded organ, both in length and calibre. It is not asserted, however, that this double contraction immediately closes the mouth of the divided vessel. The second cause is lateral pressure made on the extremity of the bleeding vessel by the blood being thrown back on the artery, and injecting the cellular sheath. The third is the formation of a clot, or coagulum of blood, within the mouth of the artery, and also of another exterior to it, but attached to the mouth of the vessel, adhering to its cut edge, and closing its orifice. Lastly a diminution of the impetus of the circulating blood, occasioned by the hemorrhage.

Now if, on careful observation, the same effect, which has been attributed to the co-operation of all the above causes, is ascertained to be produced under such circumstances that no one of them can be supposed to have the smallest influence, we shall be compelled to seek for other causes, and to adduce some principle in explanation of these phenomena which Dr. Jones has overlooked.

If we carefully examine each one of the causes to

which Dr. Jones has ascribed the suppression of hemorrhage, we shall find that no one is adequate to the degree of influence which he supposes. The spontaneous contraction of the artery is in itself certainly got sufficient, for no artery is capable of that degree of contraction which shall obliterate its own calibre; consequently it can only diminish the stream of blood.

The lateral pressure, effected by means of blood injected into the cellular tissue around the artery, certainly cannot be supposed to occur when the artery is completely divided, together with the adjacent parts, as in amputation; because there is then nothing which may repel the jet of blood and throw it back into the arteral sheath. Arteries thus severed, however, cease to bleed even more promptly than when divided under different circumstances.

In amputating the thigh I have in two instances tied only the femoral artery, all the others ceasing to bleed almost immediately, without the use of any mechanical means. One of these patients was a child six years of age—the other a young man of less than thirty. Both survived the operation and are still living.

In three instances I have amputated below the knee, when I had no occasion to tie any artery, and in neither of these cases was the action of the heart and arteries remarkably depressed, nor did there occur, at the time of the operation, any unusual degree of faintness.

Respecting the coagulum of blood which is supposed to be formed at the orifice of the divided artery, and to oppose an obstacle to the further effusion of blood, we can scarcely conceive how it can be formed in the mouth of the vessel while it is still emiting a full stream

of blood; hence it would seem to be rather the *effect* of the suppression than the cause of it, and is probably formed from some of the last drops effused. Perhaps, however, it may still be thought that, although the coagulum does not itself suppress the hemorrhage in the first instance, yet it may prevent any subsequent effusion. This, indeed, appears plausible, but there are certain facts which render it quite improbable that even thus much is effected by it.

In cases of arteries wounded under circumstances calculated to favour the greatest possible degree of lateral pressure, and the formation of a firm coagulum, these causes are found to be by no means adequate to the suppression of hemorrhage. I have witnessed a considerable number of cases in which deep seated arteries of the limbs have been wounded by sharp pointed and narrow instruments, when the soft parts have become very much injected with blood and the hemorrhage long enough suppressed to ensure the fullest effect from the lateral pressure of blood and the formation of a coagulum, and yet the bleeding has recurred again and again, and only been suppressed by tying the artery which has been but partially divided. Such cases must have occurred in the practice of almost every surgeon.

The rationale of Dr. Jones does not in a satisfactory manner explain the fact, that arteries, which are suddenly broken by a violent pull, do not emit blood so furiously as those which are divided by a sharp cutting instrument. In many cases, in which arteries, and those of very considerable size, are torn off, together with a limb, there occurs no hemorrhage. Several in-

stances of such accidents are upon record and familiarly known. A remarkable case of the kind recently happened in Vermont and has been reported by Professor Mussey. The arm, together with the scapula, was torn from the body by a mill-wheel; there occurred at the time but a very trifling effusion of blood, nor did there follow any secondary hemorrhage, although no ligatures were employed.

Now we should be inclined to think that such violence done to the contractile textures of the artery would so paralyze them as to destroy their vital power of contraction; and as it often happens that scarely a drop of blood is effused at the instant of the separation, we should hardly suppose that the coagulum can form so promptly as to contribute any thing to the effect, but should be rather inclined to ascribe the absence of hemorrhage, in such cases, to a loss of vital power in a portion of the artery which is left attached to the body.

The following cases strongly favour the supposition that blood will not be propelled by the heart through a portion of an artery which is inactive, although it remains perfectly open, and the heart acting at the same time with its usual force.

In the year 1802, I was consulted by a patient on account of an obstinate ulceration upon one of his great toes. On examination I found the affection to be dry gangrene. The whole of the last joint was dead, and it had progressed half way up the second.—I was not at that time aware that such affections are generally accompanied with ossification of the arteries of the leg. As the sound parts were sufficient to co-

ver the end of the bone, if amputated at the first joint, I performed the operation. I was much surprised on observing that, although I used no tourniquet, there did not a drachm of blood follow the knife.

The operation, however, did not subdue the disease; the gangrene recurred in the stump, and gradually extended up the foot as far as the instep, which assumed a dark red hue, became hard to the feel, a little enlarged, cold and extremely painful. Whenever any thing stimulating was applied to the part affected it greatly, aggravated the pain and hastened the progress of the gangrene. Warm applications, of the temperature of the body, produced intolerable anguish.

Several months after the first opperation I again saw the patient, found the disease advancing and the foot exhibiting the same appearances described above. His pulse at the wrist was strong and full, and there was no want of force in the action of the heart and large arteries of the superior extremities; his muscular strength was not much reduced. The pain endured by the patient was so severe as not to be subdued by opiates.

From the circumstance that the part on which I had at first operated was in an unnatural state, the greater part of the foot having been changed in its structure and become cold, swollen and hard to the feel, while the soft parts above the ankle were quite natural in appearance and feel, I was induced to hope that, if the diseased member were removed above the ankle, the operation might result more favourably than in the previous instance. I therefore advised to remove the foot, at the same time informing the patient that should the operation not succeed agreeably to our wishes, yet, as

the stump would be a less sensitive part than the foot, there would probably be less pain. The patient, more desirous to be relieved of his intolerable anguish than to protract his existence, readily consented.

In this operation I employed no tourniquet, but directed a pupil to compress the artery with his hands.—After cutting through the soft parts, and while turning back the flaps, I perceived something hard in the flesh, and felt something crush under my fingers.

After sawing the bone, and when I came to look for the great arteries, I found them all in a state of complete ossification. They were, indeed, mere tubes of bone, and I had broken them in the flesh above the place were they were divided in the operation. I dissected out that portion of the posterior tibial which was thus broken, an inch and a half in length, and found it to be an osseous tube with a perfectly free calibre.

Though all pressure was immediately removed from the artery above, and no other means were used to suppress the hemorrhage, yet not half a table spoonful of blood followed the operation. At the same time the action of the heart and of the arteries at the wrist was vigorous. Although this last wound never healed, yet the vigour of the patient's constitution protracted his life for between two and three years after this event.

This case in my mind overthrew the whole of Dr. Jones' theory of the suppression of hemorrhage in divided arteries. Here certainly there was no contraction in length or breadth, nor was there any lateral pressure. The orifices of the divided arteries stood permanently open, and their canals were entirely unobstructed. Surely we cannot suppose that coagula

were formed while I was cutting through the divided arteries, for no blood of any consequence followed the knife.

There was an important circumstance attending this case which remains yet to be explained, and which I could not at first comprehend. There certainly must have been some blood conveyed by those ossified arteries previously to their division,—otherwise there could not have been maintained, in the foot, the degree of action which actually did exist. Had the blood been conveyed to the foot by the anastomosing branches, as occurs in the application of a ligature to a large artery, these collateral branches should have been enlarged, and should have bled freely on being divided.

What then, let us inquire, could have so immediately suppressed the flow of blood in these ossified arteries on their being divided, there being no mechanical obstruction of any kind to its egress; or rather, what power could have maintained in these arteries the flow of blood which so instantly ceased on their division?—The *vis a tergo* of the heart was certainly not diminished.

The solution of these queries, which to me appears most satisfactory, is the supposition that the active power, lost by the division of the arteries, resided in the capillary system of blood vessels in the foot.

That the capillaries exercise a control over the current of blood in the large arteries, promoting its transmission, is rendered highly probable by numerous facts which may be adduced. It is well ascertained that when arteries are partially divided, the hemorrhage is often obstinate, even in small vessels, and although sup-

pressed for a time by mechanical pressure, or by a weakened circulation from loss of blood, yet the bleeding will repeatedly recur, till subdued by the application of a ligature, or the complete division of the artery; for it is well known that the latter, unless the artery be very large, suppresses the bleeding.

Now these facts have been accounted for by the supposition that while the artery is only partially divided, it cannot effectually contract; but in the case of the ossified arteries, the blood ceased to flow as soon as they were divided, although there occurred no contraction to which that event might be attributed.

There are other facts relative to the case in question which should not escape observation. When any thing warm or stimulating was applied to the foot (this being colder than any other parts of the body,) it greatly increased the pain. This I apprehended to have arisen from the action of the capillaries being excited beyond the degree corresponding to the quantity of blood received through the ossified arteries, which unavailing action of the capillaries may be supposed to have created much pain.

In confirmation of a position, that in cases of ossified arteries the pain produced by the application of heat to the extremity, is owing to the capillaries being too much excited for the quantity of blood which they receive, I would observe, that in other similar cases in which gangrene has commenced, I have observed the pain to be increased by placing the limb on a level with the body in the bed, and to be rendered more tolerable by placing it in a depending position. I used to remonstrate with my patients in regard to this particular,

and earnestly charge them to keep the limb elevated. They, however, persisted in asserting that the pain was intolerable when the limb was raised to a level with the body in bed, and greatly relieved when depressed.

This interesting phenomenon is accounted for by the fact that, in such cases, the *vis a tergo* of the blood in the arteries is not sufficient to carry it through those vessels, which are themselves inactive and unconnected with the capillaries. Therefore as the blood is with difficulty, and not in sufficient quantity, furnished by the arteries to the capillaries, these latter are compelled to increase their action in proportion to the defect of action in the arteries.

That there exists in the capillaries such a power of thus increasing their action, as peculiar circumstances may require, the following facts will prove:—I once had occasion to tie the external iliac artery for inguinal aneurism. The instant the artery was tied, the patient experienced a most severe pain through the limb, and before we had applied our dressings the limb was sensibly colder than the other. At the end of three hours, however, it became obvious that the diseased limb was sensibly warmer than the other, and at the end of six hours both limbs were of the same temperature.

My conjecture was, that in the first instance the cold was produced by sudden diminution in the quantity of blood sent to the capillaries by the arteries, causing a suspension of their action, and that the heat which followed was the result of the increased action of the capillaries to attract blood to them-

selves, a phenomenon analogous to many other operations which take place in the animal economy, and which are usually ascribed to the recuperate powers of nature.

It may seem paradoxical that the capillary vessels should possess the power of soliciting forward blood from the heart, which has been heretofore regarded by most as the only organ *actively* concerned in the circulation of the blood, and even at the present time has chief importance attributed to it. A recent writer of reputation states, as I observe, that the heart, in his opinion, is adequate to the complete circulation of the blood through the arteries and veins. We have, however, many unequivocal facts which prove the contrary.

In every case of local inflammation, before the action of the heart and great arteries is in the least changed, there is an accumulation of blood in the capillaries of the part inflamed. This could not, indeed, take place if the blood was not furnished to them by the heart and arteries; but, in such cases, the action of the heart is not directed to the inflamed part more than it is to every other part, nor more to that particular part than it was before the inflammation took place. It follows, therefore, that the change in the part diseased, producing an increased quantity of blood and an increased evolution of heat, must depend on some change in the action of the vessels of the part, and not at all on the *vis a tergo* of the blood impelled by the heart.

There are other causes which render this power of the capillaries still less equivocal. In certain morbid vascular structures, the blood vessels, of which they are chiefly composed, are observed to have the power

of drawing blood from the surrounding parts and discharging it from the system.

A lady had a small vascular tumour on the neck, of the size of a common strawberry. It was attached to the skin by a neck less than half the diameter of the tumour, and was in a degree pendulous. This tumour often bled, and it was observed that emotions of the mind frequently caused it to effuse blood. Sometimes the blood flowed in a small stream, but it generally dropped in large drops, which followed each other in quick succession. When the patient, after my being called, was informed of my arrival, the agitation which she experienced immediately caused the tumour to bleed, and on my examining it, I found it still bleeding freely.

I immediately cut off the tumour level with the sound skin, and the bleeding at once ceased; not three drops of blood following the opperation. In this case the vascular tumour seemed to operate like a pump, attracting the blood from surrounding parts and discharging it from the system. This is by no means a new or solitary case; it has been long known that, in cases of fungous tumours which bleed, the only effectual and certain method of restraining the hemorrhage is to cut off the whole tumour down to the sound part.

Another example of the same nature, and which serves to illustrate the principle under consideration, is found in those vascular tumours often met with on children, called *nævi materni.* * Those tumours are composed chiefly of blood vessels of a very tortuous form; they are always of a higher temperature than

Note. J. Browns [illegible] exactly of this [illegible]
[illegible]
[illegible]

the adjacent sound parts, and if wounded bleed furiously; the blood is thrown out from the divided vessels with much greater force than from the divided arteries in sound parts of the same volume, as I have had several opportunities of witnessing. For this reason we have been advised by surgeons, in case we remove such tumours with the knife, to make the incision in the sound parts beyond the limits of the disease, that we may thus avoid fatal hemorrhage. If this be done the hemorrhage is as easily restrained as it is in similar wounds on any other part of the body.

These phenomena can not be accounted for upon the principle of mere debility or relaxation of the arteries and veins of the part: their thus receiving a larger quantity of blood but proves the existence of a peculiar action which enables this congeries of vessels to attract the blood from the surrounding vessels.

The fact which I now proceed to state is familiar to most practitioners and especially to accoucheurs. In natural and healthy labour when the child is born alive, if we examine the umbilical cord, immediately after the birth and while the placenta remains in the uterus, we find the two umbilical arteries beating strongly. If we then wait a few minutes and examine that part of the cord next the placenta, we find them beating rather faintly, and by waiting still longer we perceive that the pulsation has ceased in that part of the cord farthest removed from the child. Gradually the pulsation ceases along the cord from its placental extremity until it is no longer felt even at the umbilicus; and if it be then divided there will occur no effusion of blood.

Now the question to be solved is why, after the birth

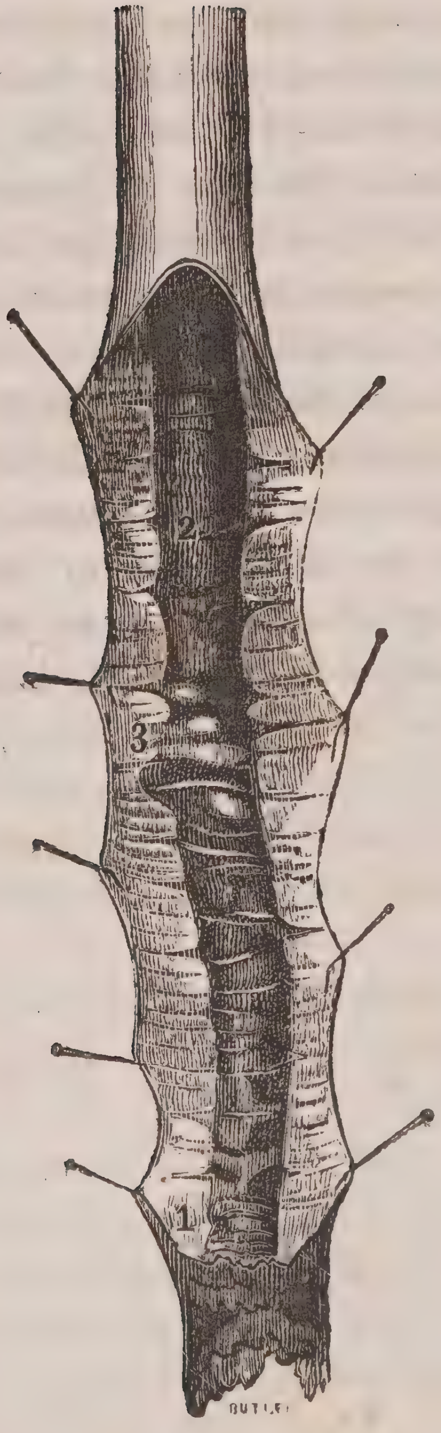
of the child, does the blood cease to pass through the umbilical arteries, in which, a few minutes before, it circulated with so much force. These arteries are branches of the hypogastric, and there appears to be no more impediment to the entrance of the blood into them than there existed before the birth of the child.—To me it does not appear attributable to the change of temperature which the part experiences, for the circulation in the arteries ceases while the placenta remains in the uterus of the mother; and as for the cord, it is not more exposed to cold than the legs of the child: and we therefore can see no cause why the impression of cold should not stop the circulation in the latter as well as the former.

The fact cannot be accounted for by a hemorrhage from the extremities of the arteries; for the blood vessels of the child have no communication with those of the mother. When the birth is perfectly natural, and the placenta separated entire without laceration, there is never any blood from the child discharged by the placenta.

I am not aware that in this cord there exists any mechanical obstruction to the circulation of the blood through the cord, and yet the result which I have mentioned is constant and uniform. Here, as there is no division, there can be no retraction of the arteries, and no coagulum formed which can directly or by lateral pressure obstruct the artery; and yet the blood ceases to circulate as promptly as when effected apparently by these causes.

To explain this phenomenon, we must have recourse to a law of the animal economy which I have not seen

noticed by any medical author; and yet it seems to be a general principle, and certain in its operation. I allude to this,—that when any function is cut off from the system or totally destroyed or superseded, all that action which went to support that function in a longer or shorter time entirely ceases. The placenta during gestation performs the office of lungs for the fœtus, and after the birth, when respiration is established, this function of the placenta is not wanted and of course ceases; and the action of the arteries ceases because it would not subserve the functions of the economy, but rather would be injurious. Instead, therefore, of referring this change to mechanical causes, it must be referred to a law of the animal economy: which is the ultimatum of many of our researches, and seems to be pursuing the subject as far as it can be traced.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SPONTANEOUS CESSATION

OF

HEMORRHAGE

FROM

LACERATED ARTERIES.

BY N. R. SMITH, M. D.

The opinions which have been stated by various surgeons, relative to the spontaneous cessation of hemorrhage from lacerated arteries, are exceedingly vague and contradictory. From this we may infer that the subject has not been thoroughly investigated by experiment. M. Richerand states, that large arteries, when ruptured, become closed (*se reserrent*) partly in consequence of the chill which they suffer, producing spasm; and partly by the pressure which the muscles, within which they retract, exercise upon them.* M. Delpech states, that when a limb has been torn from the body, the principal artery is sometimes broken within the parts of the stump which have resisted the violence, and sometimes within the lacerated limb, so as to hang out at the wound. In neither case, he says, is hemorrhage

* Nosographie Chirurgicale, tom. 1. p. 70.

apt to take place. He has so much confidence in the security of the vessels, that he advises not to seek for them, in treating lacerated wounds, unless they bleed.* Mr. Charles Bell says, "A torn artery does not bleed. I have heard it affirmed that, in this case, the blood was stopped by the rugged portion of the inner coat of the vessel, which is torn into shreds by the violent elongation of it. It has been said, if we disclose the radial artery of a dead body, and, putting a probe under it, tear it forcibly, the inner coat will present an appearance of valves to intercept the flow of blood. I believed in this statement, but, upon the experiment being repeated, I found that in a young and healthy artery, the change could not be exhibited." Professor Gibson asserts that the indisposition manifested by a lacerated part to bleed, is owing to the injury sustained by the nerves, not only in the immediate vicinity of the wound, but to a greater extent around than the eye can discover. Hence the arteries are paralyzed, and do not contract to propel the blood, which coagulates in their cavities, or among the torn muscular fibres.†

It is apparent, therefore, that the mode in which hemorrhage from lacerated arteries is arrested, is by no means an established principle in surgery. For the purpose of furnishing facts which may aid to render it such, the following experiments were instituted:

Experiment 1.—Having exposed the femoral artery of a young slut, not fully grown, I passed a smooth iron hook under it, and lacerated the organ with a sudden

*Precis Maladies Chirurgicale, tom. 1. p. 188.

†Gibson's Surgery, vol. 1. p. 92.

pull. Blood immediately gushed from it in a rapid stream, and continued to flow copiously, for about four minutes. At the end of that time, the blood on the table began to coagulate, and, simultaneously, the bleeding began to be less impetuous. It gradually diminished, and in ten minutes had ceased altogether. The animal was then shut up, but suffered to move about the room. No bleeding recurred. At the end of twenty-four hours she appeared quite well, moved the limb with freedom, and took food greedily. She was then killed with prussic acid. On examining the limb it was found slightly swelled. Blood was injected in small quantity into the common tissue, and a coagulum was formed in the sheath around the artery. The upper extremity of the artery was not retracted between the muscles, but was quite superficial. The external coagulum did not exercise much pressure upon it, for its extremity was larger than natural. I then dissected the artery from its sheath, to the extent of three or four inches, and opened it longitudinally, from above downwards. Two inches from the wound I encountered a slender coagulum, which increased in diameter as I traced it downward, and which completely stuffed the organ for one inch from its orifice. The external coat presented a lacerated margin, which, however, had become somewhat indistinct by the effusion of lymph.— The internal coat was lacerated transversely, in many places. Into many of these, slips of the internal coagulum were inserted; the blood which had issued from the fissures, appeared to have incorporated itself with that which filled the vessel, and thus to have at first attached the coagulum. From many other fissures a very

apparent quantity of lymph had been effused—had blended itself with the coagulum, and fixed it so firmly in its place, that it was difficult to scrape it away. The artery was so firmly stuffed with the coagulum as to be considerably dilated. Not a drop of blood could possibly have escaped from it in this state.

Experiment 2.—The carotid artery of a full-grown dog, of large size, was exposed on the left side of the neck, and lacerated as before. The artery broke deep in the chest, and bled for five minutes with great rapidity. The animal then gave signs of fainting, but they soon disappeared, and the blood quickly ceased to flow. He was suffered to live four hours, during which time there was no bleeding. He was then killed, and while dying he struggled very violently, but there was still no bleeding. The chest was then opened and the artery traced from its origin. It proved to be a branch of the innominata. Its internal coats were broken at its very origin. The external tunic was broken at the distance of an inch and a quarter from the innominata, the internal coats were withdrawn from within the external, which formed a loose pouch projecting from the innominata, and stuffed with a firm coagulum. In this case there was no lymph effused, time enough not having elapsed. The external coagulum was voluminous and firm, occupying the interstices of the adjacent organs, and extending to the external wound. It had not, however, made pressure enough to interfere with respiration. The cervical portion of the broken artery was hanging from the wound, to the extent of two inches. This had also bled freely, at the moment of the rupture, but had soon ceased to do so. Its internal

coat was ruptured transversely at many places, to the extent of three inches. Near the extremity it was filled with a coagulum which adhered to the transverse fissures in the internal coat. It must have been, of itself, an effectual barrier against the effusion of blood.

Experiment 3.—I procured a horse twelve years of age, of pretty good constitution, though very lean, and having cast him upon his side, laid bare the carotid. I then passed a smooth iron under the artery, and broke it, as I had done in the previous experiments. The blood gushed in a torrent from the wound, and, in a few minutes, the animal lost two or three gallons. In about ten minutes the blood upon the ground began to coagulate, and then the diminution of the rapidity of the current was manifest. The extremity towards the chest hung out at the wound, to the extent of three inches. While the blood was flowing rapidly the animal moaned once or twice, as if a faint, but soon after, he rose from the ground without difficulty, and stood till the blood had entirely ceased to flow, which was after about thirty minutes from the time the artery was ruptured. The projecting artery was then returned to its place and the wound closed. The animal was suffered to live for twenty-four hours, during which time he appeared nearly as vigorous as before the operation, and took food with avidity. He was then killed by a blow on the head, but, while dying, he struggled very violently. Blood gushed from small vessels in the wound, and I feared, at first, that the obstructions in the artery had given away. But on examination I discovered that not a drop of blood had issued from either extremity of the artery. The lower portion of the artery was

found perfectly naked, to the extent of three inches from the rupture. Beyond this, its sheath was occupied with a coagulum of blood, as was also the common tissue in the vicinity. No lateral pressure, however, was exercised on the artery to impede the passage of blood, as the organ was even increased in volume.—The interior of the artery was found plugged with a coagulum six inches long, which completely filled its cavity for nearly its whole extent. The internal coat, as in the preceding experiments, was ruptured transversely at a great many places, and little productions of the internal coagulum were inserted into them so firmly that they must have securely fixed the coagulum, as soon as coagulation had taken place. From many of the fractures in the internal coat, lymph, in quantity, had been effused, and become blended with the coagulum, which was thus so firmly attached to the surface of the organ that it required an effort to detach it. No blood could possibly have passed through it, and as the coats of the artery every where retained their vitality, no secondary hemorrhage could have subsequently occurred. The accompanying Plate accurately represents the preparation which I made of the parts, by slitting open the artery longitudinally, and leaving the coagulum in its place.

Figure 1, marks the entire artery; figure 2, the coagulum; figure 3, the internal surface of the organs marked with the transverse fissures in the internal coat; figure 4, the point at which the thyroid branch was given off. Here the coats were much lacerated, and a great quantity of lymph was effused, sealing up the organ.

Experiment 4.—The carotid of a large dog was laid

bare, raised with a hook from its sheath, and divided. Its extremities then retreated into the sheath. The gush of blood was impetuous, but, at the first moment, little if any more so than when, in experiment 2d, the artery was torn. There occurred no abatement in its force, however, till the animal fainted, which was after five minutes. The bleeding then almost entirely ceased for a moment, but presently returned, and in less than ten minutes the animal expired. The abdomen of this dog was then opened, a hook was passed under the aorta and the vessel was broken. The organ being dissected out, was then examined. Its internal coat was ruptured, precisely as by similar means in the other experiments. In some places it was peeled up from the middle coat, so as to form pockets on the side of the artery; but this was the only instance in which I found any thing of the kind.

Experiment 5.—I opened the abdomen of a large dog, and having exposed the aorta above its bifurcation, I attempted to break it in the manner mentioned above. The flow of blood was very rapid, and this, together with the irritation necessarily produced from the exposure of the abdominal organs, rapidly prostrated the powers of life, and the animal died in about five minutes. There was, however, an ineffectual effort at reaction. No other result could have been expected in this experiment, because the bleeding was so copious as to destroy life before coagulation could be effected. On examination, I found that the aorta itself was not ruptured, and that the laceration had taken place in the external and internal iliacs. The blood, therefore, had flowed from several large trunks, a wound of either of

which is ordinarily fatal. I was surprised to find, however, that each of the lacerated arteries had its orifice closed with a coagulum, which had probably been formed *in articulo mortis.* The internal coat of each was lacerated, as in the other experiments, and a portion of the external coat, in every instance, projected beyond the lacerated margin of the internal coats, to the extent of half an inch or more. The extremity of each artery appeared enlarged and bulbous, from the presence of the coagulum within it, adhering to its rough, cellular surface. I was persuaded that, had not the flow of blood been so rapid as to destroy life before coagulation could be completed, this animal would not have perished immediately.

The above experiments will, I think, justify the following conclusions:

1st. That Dr. Jones errs in ascribing the cessation of hemorrhage from lacerated arteries, mainly to the same causes which avail against bleeding from divided arteries. In the experiments detailed above, the retraction and contraction of the organ availed nothing. The same was true in regard to the external coagulum, which according to Dr. Jones is the principal agent.—In each of the experiments, the extremities of the vessel were rather dilated than constricted or compressed. In one instance (*Exper.* 3.) the artery hung naked from the wound, and yet the bleeding ceased as promptly as under other circumstances.

2d. Equally untenable in the doctrine that the artery is paralysed by the shock inflicted upon its contractile tissue, and that the blood refuses to flow through a passive tube. In every experiment there was ex-

tensive injury inflicted upon the artery, and in one, the organ was torn from the surrounding parts to a great extent; consequently its vital intercourse with them must have been for a time interrupted, and its own action suspended. This paralysis of the artery should be most perfect instantly after the injury; but we find that the blood then flowed in a rapid stream, which was undiminished till it had had time to coagulate. It is true that in those cases on record, in which limbs have been torn from the body, there has been, even at the moment after the injury, no considerable bleeding. But this has undoubtedly arisen from the shock given to the general system, and the suspension of the action of the heart, till the blood had coagulated in the extremity of the artery.

3d. Although the pockets, or valves mentioned by Mr. Bell, were in one experiment formed on the sides of the lacerated vessel by the rupture and partial detachment of the inner coat, yet these were not found efficient in suppressing hemorrhage in a single instance, when the experiment was performed on the living animal.

4th. The efficient, and almost only cause of the cessation of hemorrhage from lacerated arteries, is the unequal laceration of the external and internal coats. Generally the internal coat is fractured transversely at numerous places, so as to present an indefinite number of small fissures, into which the blood of the artery is injected, and thence, perhaps, conveyed by interstitial absorption into the arterial tissues. Blood, also, probably flows from the ruptured tissue, and mingles with that in the cavity of the artery. As soon as coagulation

begins to take place, blood concretes, probably first on the fissures produced in the internal coat, attaching itself to the rough surface which is there produced, and insinuating itself into the interstices in such a manner that the coagulum becomes so firmly fixed as to resist the impulse of the circulating blood.

When an artery is smoothly cut, and the integrity of the inner coat is uninjured, the coagulum finds no point-d'appui, or roughness upon which it can take hold. The surface is every where polished and lubricated for the very purpose of facilitating the passage of the blood, and therefore the internal coagulum, as it forms, either glides from the artery, when the organ is very large, or perhaps does not form at all, the particles finding no rallying point within the vessel. But when the internal membrane is extensively ruptured, the blood must necessarily concrete upon the lacerated surface, precisely as it is uniformly observed to do in other wounds.

In some instances the complete separation of the internal coats will take place at some distance from that of the external, or cellular, which will then hang as a loose pouch from the end of the more rigid middle coat. Its surface being cellular and lacerated, the blood, rushing along it with force, is injected into this tissue, coagulates upon it, and attaches itself firmly to it. The external coagulum, which forms in the lacerated sheath, will then aid to sustain the internal coagulum and suppress the hemorrhage.

After the internal coagulum has remained attached for some hours to the fissures produced in the internal coat, from each one of the ruptures there takes place

the effusion of lymph. This still more firmly attaches the coagulum to the internal surface of the organ, and the more effectually stuffs its cavity. Finally, it takes the place of the coagulum of blood, and obliterates the cavity of the artery.

It may be asked, if nature resorts with so much uniformity, precision and effect, to these means for suppressing hemorrhage from lacerated arteries, how does it occur that fatal hemorrhage should so often result from the rupture of arteries which are broken without a corresponding rupture of surrounding parts and of the skin? These injuries are sometimes inflicted on large vessels in effecting the reduction of old dislocations.—Many cases of the kind are on record. The probability is that arteries thus yield in these instances, sooner than the surrounding parts, because they are diseased and brittle. The external coat having lost its extensibility in consequence of the deposition of lymph in and around it, breaks abruptly without effecting the laceration of the internal coat at more than one place. Besides, we know that when there is no external wound, effused blood does not coagulate with facility, and remaining fluid, opposes no obstacle to fatal hemorrhage. If Mr. Scudamore's explanation of the coagulation of blood be correct, it refuses to coagulate promptly, under these circumstances, because it cannot exhale its carbonic acid.*

* Scudamore on the Blood.

REMARKS

ON

AMPUTATION.

It is not my present purpose to give a history of Amputation, or to point out the various improvements which have been made in that operation by different individuals, but to contrast the method which I have adopted, with the present mode. I say the present mode, for, as far as I know, amputation is performed generally in a similar manner throughout the United States and Europe, which is as follows: The tourniquet being fixed on the limb, the operator standing by the side of the patient, with an assistant, who draws up the flesh, so far as to straighten the skin with a long straight-edged knife, makes a circular incision around the limb, through the skin and cellular substance down to the muscles. He then separates the adipose membrane from the muscles with the scalpel, and folds it back with the skin, and in this manner lays the muscles bare to a certain distance above the place where the skin was divided. He then cuts the muscles down to the bone, as high up as they are laid bare, and having again separated the muscles from the bone to a certain

distance above where the muscles were cut, retracts the soft parts, and saws off the bone, as high as the muscles have been separated from it. The arteries being tied, the soft parts are brought together and secured by sticking plasters.

This I believe to be substantially the mode of operating in this country, and when the operation is nicely performed, and a due proportion of soft parts is preserved to cover the stump, and well secured, the cure is effected in a short time, and the stump is a pretty good one. But in an operation of so much importance, and attended with such serious consequences to the patient as amputation, every circumstance which can render the operation less painful, or effect a cure with less inconvenience, or obviate with more certainty the accidents that occasionally produce a bad stump, deserves attention.

The objections to the present mode of amputation, as I have above described it, are, 1st, that in the most perfect operations, where the soft parts are brought together, so that the edges of the skin on the opposite sides meet each other, the stump will be angular, that is, there will be two projecting portions of skin, one on each side of the limb, which give it a disagreeable appearance, and when healed will render it liable to excoriation and inconvenience from an artificial limb.

2d. As the skin and cellular substance are to a certain extent separated from the muscles, and project or fall below the cut muscles, the end of the bone will be covered sometimes by the skin, and cellular membrane only.

3d. As there can be no rule given for the length of

the soft parts, which are to be preserved to cover the end of the bone, which will apply to limbs of different sizes, it must be left to the surgeon, whilst operating, to judge how far he will separate the skin from the muscles, and the muscles from the bone. And as a large limb will require much larger flaps to cover the stump than a smaller one, it happens occasionally that in large stumps the bone will project, whilst in small and emaciated ones, the soft parts will fall too far below the bone, and form a kind of *pouch*, which is sometimes filled with matter during the cure. Charles Bell acknowledges that such accidents frequently happen in the hospitals, and I have known them in private practice.

Now a method of operating which will with certainty obviate all these unpleasant circumstances that will form a round and seemly stump, without any projecting angles of the soft parts; that will cover the end of the bone, not only with skin and cellular substance, but with muscles, and will also preserve just the length of the soft parts requisite to cover the stump without straining, or without any superfluous portion, should undoubtedly be preferred.

The following method I have found to possess all the advantages above stated.

Having fixed on the part where the operation is to be performed, let the operator take a piece of paper of sufficient length to encircle the limb, and four or five inches in width, and apply it around the limb, so as to obtain the exact measure of it, and all the superfluous length should be cut off. It should then be folded, and the ends of the paper laid together upon a table, and a

semi-circular arc drawn with a pair of dividers, by placing one leg upon the middle of the lower side of the paper. The paper cut off upon this line will form two equal semi-circles; and when placed upon the limb, will describe two semi-circular arcs, meeting at two angles. These lines should be marked upon the limb with ink or a crayon.

Then, whilst an assistant draws up the skin so as to straighten it moderately, the operator, with a short knife having an edge on the convex side, passes his hand under the limb, and fixes the point of the knife on the side farthest from him, at the angle where the two semi-circular lines meet; with the edge of the knife turned obliquely upward, he cuts in the direction of the line through the skin, cellular substance and muscles, down to the bone, with repeated strokes. Thus having divided one-half of the soft parts of the limb, he passes his hand above the limb, fixes the point of his knife on the angle where he began, and follows the line upon the upper side of the limb till it meets his first incision.—He will then have two semi-circular flaps, composed of all the soft parts connected by their natural adhesions; these are to be turned back, a retractor applied, and the bone sawed off. After the arteries are secured, the flaps are to be brought together and secured by adhesive plasters. If the operation is performed in this manner, the time taken up will be a little less than in the common method; for there is no skinning up of the adipose substance from the muscles, and no necessity for cutting with a guarded stroke, to prevent cutting the muscles. I generally endeavour to cut through the cellular membrane into the muscles at the first stroke, and then follow this incision down to the bone.

In this operation, if the method I have described be followed, the soft parts will be in exact proportion to the stump; for by measuring with the paper, and marking as above directed, the flaps will come together with mathematical exactness, whatever the size of the limb may be, for their length must be in proportion to the size of the limb.

The soft parts will therefore come together without stretching, and will be easily retained in their places.—The stump formed in this manner is covered not only by adipose substance, but by muscles, and is better cushioned with flesh, and from repeated opportunities of comparison, it is well ascertained that such stumps are more calculated to accommodate the machinery of an artificial limb.

There is still another advantage in this mode of operating, which is, that it is often in the power of the surgeon to save a greater length of limb than could be done in the common mode; for where the skin is diseased, being ulcerated or having fistulous openings in it, I have frequently made my incisions in such a manner, as to bring the diseased part of the skin in the angles between the semi-circular lines, having the flaps extend some ways below; so that an inch and a half of stump has been saved, which would have been lost by the circular incision; and as a general rule, it may be observed that the longer the stump is, the more useful it is to the patient. And if I am not mistaken, the patient experiences less of those spasmodic twitches of the muscles and tendons after my operation, than are usually consequent upon the former method. This I attribute to the circumstance of a greater length of

muscles being left projecting below the bone, connected by their natural adhesions; so that when brought together, and retained by adhesive plasters and cross bandages, they are secured and kept steady by pressure.

The operation which I have described can be performed with any knife that has a sharp edge, but the knife in common use is not so well adapted to this mode of operating as another form, and if any surgeon will make the experiment, it will be found that the knife, which I have delineated, will be found more convenient even in making the common circular incision around a limb, than the long straight-edged knife. Being shorter, the hand has a more perfect command of it, especially its point. The convexity of its edge likewise renders less force necessary to cut through the flesh. The desire, which some operators seem to have, of cutting a great deal at one stroke, arises from want of experience; for in fact it makes no difference whether we cut all together with a drawing stroke, or whether we push the knife in a contrary direction; if the edge is perfect, the operator will find no difficulty in dividing the soft parts on account of the shortness of his knife; and the shape which is delineated in the plate is better adapted to cut the angles marked out on the limb than any other form.

I have given a drawing of a limb with the semi-circular lines made on it, appearing as they do before the operation is commenced. In amputating the thigh, I generally make the angles on the outer and inner sides as marked on the drawing, except in cases where I operate so high up as to have the artery exactly on the inside of the thigh; in that case I make the angle a little

above or below the artery, so that the artery may not come directly in the angle between the two flaps, which might render it a little more difficult to take up; although this has happened to me, and the artery was secured without difficulty; or if there should be any disease in the soft parts, so situated that by making the two angles in a different part, more length of stump can be saved, they should be placed differently, for it does not make much difference in amputating a thigh where we make the angles.

In amputating the leg below the knee, the angle should be made, the one anteriorly, and the other posteriorly; for if the angles are made as in the thigh, the one on the inner, and the other on the outer side, when the flaps are brought together, the flap on the anterior part of the leg will fall over the sawed edge of the tibia, which will be apt to cut through it.

This happened in one case where I operated in this manner; but by making the angles one anterior and the other posterior, the flaps will approximate in a very easy and handsome manner, and the diameter of the leg is less from right to left, than from before backward.

The mode which I have recommended for the amputation of all the limbs, has been practised by Charles Bell, in amputating the fingers, toes, and also the forearm. In amputating the fore-arm, one angle is to be formed over the radius; and the other over the ulna.—In amputating above the elbow, the angles and flaps may be adapted to the circumstances of the case or convenience of the operator, who will always find it most convenient to stand so as to have his left hand

towards the upper part of the limb; therefore, when he operates on the right arm, he will stand behind the patient; and when he operates on the left, he will stand before him.

The adhesive plasters which I have used have been applied differently from the common method; instead of applying them in large strips, I cut them in the following method. Take a strip fifteen inches in length, and two in width, and by doubling it in the middle, divide it in the manner represented in the plate.

In applying a strip, the shoulder should come within half an inch of the cut edges of the skin; and the corresponding one in a similar manner on the opposite side; draw the tongues of the plaster across the stump till the edges of the skin are brought together; when they are to be secured. This mode approximates the edges more closely than is done in the common manner, and is equally applicable to all cases where the object is to unite divided parts by sticking plasters.

This mode of amputating I have followed for the last twenty years, during which time I have performed the operation a great number of times; and during that period, have never made a bad stump, or any trouble about the length of the flaps.

Lately, some improvements have been made in the mode of performing the operation. The knife recommended is a long straight catlin, double-edged at the point. It is intended to transfix the limb, and then to cut obliquely outward, forming two semi-circular flaps similar to those made by my operation.

The suggester of this improvement estimates very justly the importance of leaving the parts of the stump

connected by their natural attachments, and thinks that by cutting in this manner, the patient suffers less pain.

I have not had an opportunity to put this mode of amputating to the test of experience on the living subject, but have repeatedly performed it on the dead. It may be performed with this kind of knife very neatly and speedily, and in most cases, I think it preferable to the other mode of cutting from without inwards. The stump will be the same in both cases, if the flaps are alike and of a proper length for the size of the limb; but I would advise that the limb should be marked by an exact measurement in the manner I have described above.

I have mentioned the use of the tourniquet, but it is more than ten years since I have used the common one. The instrument should indeed be condemned as worse than useless. The means I have employed to stop the hæmorrhage, are the handkerchief and stick, which are easily and quickly applied, not liable to slip or break, and always effectual. Their application is simple, being nothing more than tying the handkerchief loosely round the limb, passing a piece of wood a few inches in length underneath it, which upon being turned, produces a powerful and quick compression.

Mr. Symes has made what he considers as an improvement in the method of restraining hæmorrhage; which consists in making direct pressure on the artery alone, and thus diminishing the quantity of blood in the limb. When the artery is effectually compressed a few minutes before the operation is commenced, it must certainly have that effect.

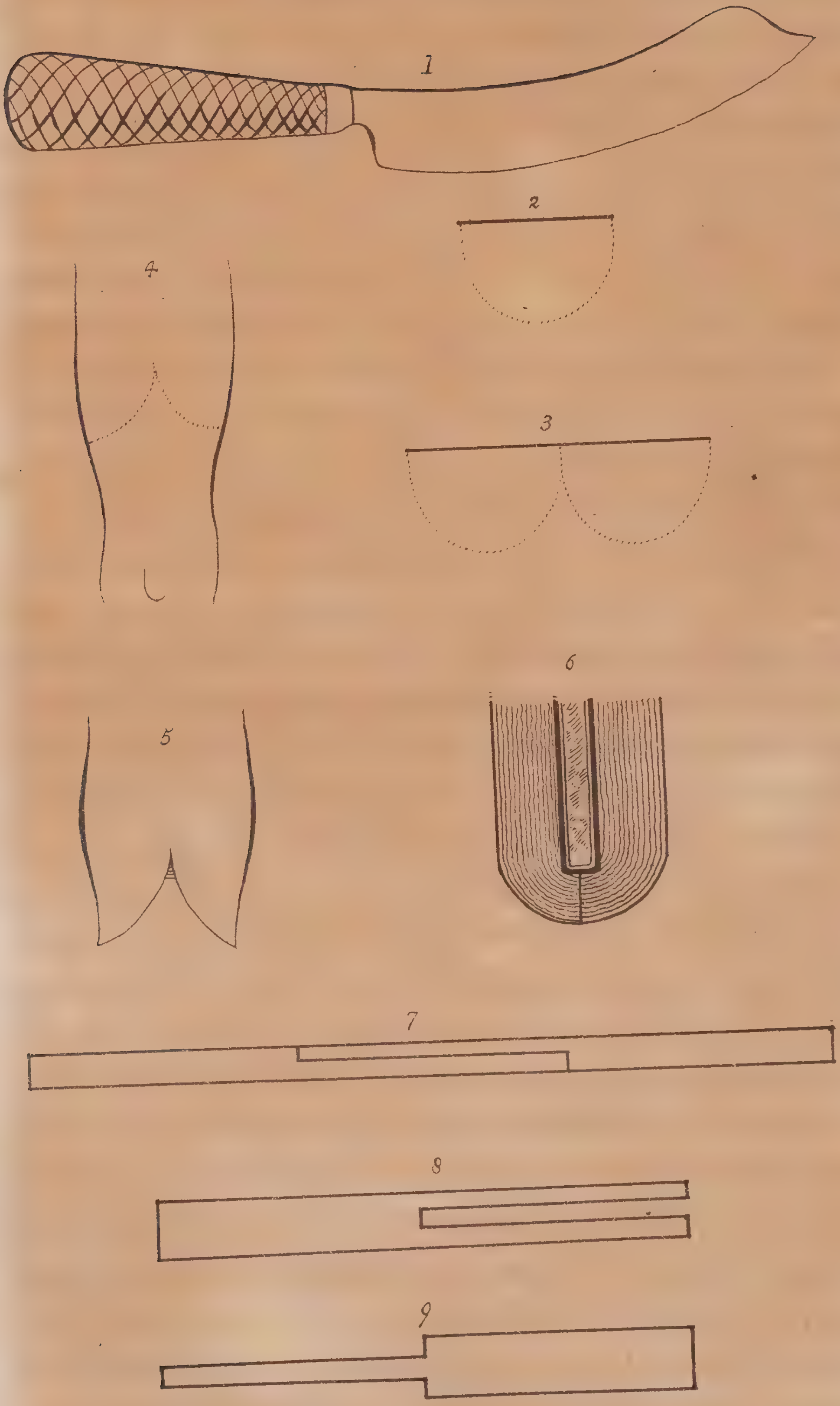
An objection against the common form of the tourni-

quet acting with a screw, is that it operates so slowly as to retard the blood in the veins some time before the circulation in the artery is stopped; consequently the limb contains more than its due quantity of blood when it is amputated.

This objection does not lay so much against the handkerchief and stick, which operates much quicker, and if the precaution is taken to elevate the limb above the body a little while before the handkerchief is fitted, and the stick be turned suddenly, this objection may be obviated; or if it were important that a small quantity of blood only, should be lost, the artery might be compressed a little before the handkerchief is straightened, and the operator would have complete command of the hæmorrhage. This I think the preferable method; for if I have been correctly informed, the want of this precaution, and an entire dependence upon compressing the artery, has in one instance in this country, been attended with bad consequences, which would have prevented by the method which I have suggested.

It is certain that a pressure on an artery, which will prevent its pulsations in the limb below, will not always prevent the artery from bleeding when divided. In amputating an arm at the shoulder joint, pressure was made where the artery passes over the first rib; which stopped the pulse at the wrist. When the artery was divided, it projected a full stream of blood. The end of the artery was grasped with the fingers, however, and tied so that no bad consequences ensued.

Upon the whole, I am decidedly of opinion that the method I have proposed is the safest and best.



Lith. of Endicott & Swett.

Explanation of the Plate.

1. Amputating knife with the edge on the convex side the blade about five inches long, and one inch wide.
2. Piece of paper long enough to encircle the limb, but folded up so as to be but half its circumference, and cut out by the dotted line marked by a pair of compasses.
3. Same piece of paper spread out.
4. Limb to be amputated; the dotted lines representing the marks made with the pen or crayon, guided by the two semi-circular edges of the paper.
5. Appearance of the stump before the dressings are applied.
6. Imaginary section of the stump after it is healed.
7. Strip of adhesive plaster doubled and marked where it should be cut.

8 and 9. The same cut and spread out.

A CASE OF

OVARIAN DROPSY,

SUCCESSFULLY REMOVED BY A SURGICAL OPERATION.

The subject of this operation was a Mrs. Strobridge, of Norwich, Vermont, aged 33 years.

The following account of the case, previous to the operation, was taken from the patient:—Seven years before, she had perceived a small tumour in her right side, situated in the right iliac region; when about the size of a goose's egg, she could move it with her hand to the opposite side of the linea alba, and to some distance above the umbilicus. The patient had borne five children, two previous and three subsequent to her discovering the tumour. The youngest child was 10 months old, and was nursed at the breast when she submitted to the operation. Soon after her first pregnancy, from the commencement of the tumour, and when, as she thinks, it was about four or five inches in diameter, it suddenly disappeared, probably burst into the abdomen.—In four or five weeks it was as large as before. Before and after the bursting of the tumour she had turns of faintness, which lasted from two hours to half a day.—During parturition of her second child, after the com-

mencement of the tumour, it having acquired a considerable size, it burst again, and nothing was perceived of it till eight months had elapsed. In four days from its reappearance it was as large as it had ever been. It was again burst by a fall; great soreness of the abdomen, and confinement of the patient for several weeks were the consequence. The tumour filled again in a fortnight and from this time continued to increase; it did not burst in the dilivery of her last child, which was ten months previous to the operation. The patient's health was not much affected by the tumour. She was costive; and the size of the tumour incommoded her in the ordinary duties of her family, especially in stooping. On examination I found a large tumour in the right side of the abdomen; it was considerably moveable, and I could produce a distinct fluctuation through it.

Having decided on the operation, and determined the mode of operating, on the 5th of July, in the presence, and with the assistance of Doctors Lewis, Mussey, Dana, and Hatch, I commenced the operation as follows:—

The patient being placed on a bed, with her head and shoulders somewhat raised, an assistant rolled up the tumour to the middle of the abdomen, and held it there. I then commenced an incision about an inch below the umbilicus, directly in the linea alba, and extended it downwards three inches. I carried it down to the peritoneum, and then stopped till the blood ceased to flow, which it soon did. I then divided the peritoneum the whole extent of the external incision.—The tumour, now exposed to view, was punctured; a canula introduced, and seven pints of a dark coloured

ropy fluid was discharged into a vessel. About one pint was spilt, so that the whole fluid was about eight pounds. Previous to tapping the tumour, by inserting my finger by the side of it, I ascertained that it adhered to some extent to the parieties of the abdomen, on the right side, between the spine of the ileum and false ribs. After evacuating the fluid I drew out the sack, which brought out with it, and adhering to it, a considerable portion of the omentum. This was separated from the sack with the knife; and two arteries which we feared might bleed, were tied with leather ligatures, and the omentum was returned. By continuing to pull out the sack, the ovarian ligament was brought out, this was cut off, two small arteries secured with leather ligatures, and the ligament was then returned. I then endeavoured to separate the sack from its adhesions to the parietes of the abdomen, which occupied a space about two inches square; this was effected by a slight stroke of the knife at the anterior part of the adhesion, and by use of the fingers. The sack then came out whole, excepting where the puncture was made, and I should think it might weigh between 2 and 4 ounces. The incision was then closed with adhesive plaster, and a bandage was applied over the abdomen. No unfavourable symptoms occurred after the operation; in three weeks the patient was able to sit up and walk, and has since perfectly recovered.

I was induced to undertake this operation from the following considerations:—-The patient, though her health was not greatly impaired, was sensibly affected by the disease. She was quite certain that the increase of the tumour, in a given time, was augmented; proba-

bly, at no very distant period, it would have destroyed her. I had, also, had an opportunity to dissect the body of a patient, who had died of ovarian dropsy, after being tapped seven times. In this case the sack was found to be in the right ovarium, which filled the whole abdomen; but it adhered to no part except the proper ligament, which was not larger than the finger of a man. I have seen two other ovarian sacks which were taken from patients after death. They had been tapped several times; the sacks were equally unattached, except to their own proper ligaments. Hence, I inferred, that in a case of ovarian dropsy, while the tumour remained moveable, it might be removed with a prospect of success. The mode of operating, practised in the above case, is the same that I have described to my pupils in several of my last courses of lectures on surgery. The event has justified my previous opinions.

NOTE.

Before the extirpation of the Ovarian Tumour was accomplished by Professor Smith, as related in the foregoing pages, the same operation had been performed successfully in Germany. Of this, however, he had no knowledge, and the operation was therefore with him altogether original. As such, it must certainly be acknowledged to be one of the boldest achievements of modern surgery.

The discouraging circumstance in regard to these operations, is the difficulty under which the surgeon must ever labor in establishing the true character and relations of the tumour, before attempting its extirpation. It is for this reason, that many of the most enterprising surgeons of the present day are disposed to

decline the operation. And here, candour compels me to state that this difficulty of determining the true character of such tumours, and, consequently, the feasibility of the operation, before opening the abdomen, was experienced by Professor Smith, in two cases in which he attempted the operation, but was compelled to desist.

In one of these cases, it was ascertained, on opening the walls of the abdomen, that the uterus was also involved in disease, and, indeed, constituted the most voluminous part of the tumour. The attempt which was made in the second case, I witnessed. There was no difficulty in ascertaining from the history of the case, the character of the disease, but as the tumour filled the belly, it was impossible to ascertain its attachments, as it could not be made to move in the cavity. Knowing that the practicability of the operation was doubtful, the operator proceeded with great caution—opened the belly along the linea alba—exposed the surface of the sack—punctured it, and drew from it its fluid contents, which were very copious. He then introduced his finger between the walls of the belly and the sack, and endeavoured to ascertain its connections. Its adhesions were found to be extensive and firm—so much so that he at once desisted from further attempts, and closed the external wound. Some degree of peritoneal inflammation took place after the operation, but it was subdued without much difficulty; the wound healed, and the patient survived for three or four weeks, when the sack again filled, and also the cavity of the belly, and she died with the ordinary symptoms of dropsy.---I should here remark, that the operation of paracentesis abdominis, had been performed in this case, two or three times.

The occasional performance of this operation will undoubtedly induce a more careful inquiry into the diagnosis of the ovarian tumour, and enable us to determine with more precision the feasibility of the operation in particular cases.

30

As the operation has several times proved perfectly successful, and has thus arrested the progress of a disease which must otherwise have inevitably resulted fatally, the propriety of resorting to it, in those cases in which a clear diagnosis can be established, appears to me to be obvious, provided, at the same time, that disease is making alarming progress, and threatening life.

The principal traits with which we are yet acquainted, as characterizing the ovarian dropsey are; 1, the purely local character of the disease----the organic functions of the system being but little, or not at all disturbed---even the uterus often manifesting no morbid phenominon; 2, the location of the tumour, it first presenting itself in the iliac region; 3, its mobility. The ovary being loosely attached by the broad ligament to the uterus, and to the walls of the pelvis, is, when it first becomes enlarged, capable of being made, by pressure, to glide into almost any part of the lower region of the abdomen. Yet there is one part of the cavity which seems to be its home, and to which it most tends to retract, and that is the iliac region. 4. As the disease advances the uterine system is observed to be more disturbed in its fuctions than the other viscera of the abdomen.

The practicability of removing such a tumour is to be determined by carefully ascertaining its degree of developement, its mobility, and thus, as far as possible, its connections. When the tumour becomes so voluminous as to fill the cavity of the abdomen, and distend its muscular walls, the operation should, in my opinion, never be attempted, for then, the surface of the tumour being pressed into close and permanent contact with the viscera and walls of the belly, will have established numerous adhesions. Besides, it will be impossible, as the tumour is then immoveable, to ascertain its attachments. In a case of this kind which I dissected two years since, I found the sack very extensively adherent to the intestines, mesentery, and peritoneum.

When the tumour is very moveable, the presumption is, that its attachments are not numerous nor close.—The points of attachment we may also sometimes ascertain by pressing the tumour in various directions, and observing the resistance which is made, and the pain which is produced by its dragging upon particular parts.

I ought here to state, that the same operation has been performed in this country in several instances by Dr. McDowell, of Kentucky, and more recently by others. I am not confident that the first operation by Dr. McDowell was subsequent to that of my father.

N. R. S.

LIGATURE

OF THE

EXTERNAL ILIAC ARTERY,

FOR THE CURE OF ANEURISM.

Achilles H. Elliot, of Killingworth, Connecticut, some time in the month of June last, felt a pain in the left groin, and soon perceived a small pulsating tumour: it was situated just below Poupart's ligament, and increased pretty rapidly. On the 25th of July, with the assistance of Dr. J. Knight, professor of anatomy in this institution, I undertook the operation of *tying the external iliac artery.* The aneurismal tumor was situated in the left groin. It pulsated strongly, and from its size, it might contain eight ounces of blood. The whole limb was considerably œdematous. We followed Dr. Dorsey's mode of operating in this case, which is not materially different from that of Mr. Abernethy, who was the first that attempted this operation, and to whom we are so largely indebted for other important improvements in surgery.

The patient being placed in a proper situation, I commenced an incision, about an inch above Poupart's ligament, and directly over the external iliac artery, ex-

tending it obliquely upwards, nearly in the direction of the fibres of the external oblique muscle, about three and a half inches. The skin and adipose membrane being cut through, the fibres of the external oblique were divided longitudinally, and the internal oblique and transverse cut across, which brought the peritoneum into view. I then insinuated my finger between this membrane and the muscles down to the external iliac artery, which I readily found, and endeavoured to detach from the surrounding parts. By means of Dr. Physick's curved forceps, I then passed the aneurism needle under the artery; but owing to an imperfection in the needle, which was made on the spur of the occasion, it slipped out of my fingers, after I had hold of the point of it. I was obliged to withdraw it and fix it again in the forceps, and when I brought the point out a second time, Dr. Knight took hold of it with a firm pair of forceps and drew it through, which carried the ligature under the artery. After examining, to be certain that the ligature included nothing but the artery, I drew it very tightly. At this moment the patient complained of severe pain, but it lasted only a few minutes. The pulsation in the aneurismal tumor ceased immediately on tightening the ligature.

The wound was then dressed with adhesive straps, with a compress and flannel bandage over the whole, adjusted in such a manner as to afford moderate pressure on the wound and aneurismal tumor. Before we had finished the dressing, the limb of the affected side was sensibly colder than the other. The operation was performed about 10 A. M. At 2 P. M. the left limb was warmer than the other; in the evening I could per-

ceive no difference in the temperature of the two limbs. The affected limb as well as the whole body was in a state of perspiration, the weather being very warm at that time. The next day a pulsation was felt in the posterior tibial artery, where it passes under the malleolus internus, and the aneurismal tumor was considerably diminished. It continued to decrease, until it wholly disappeared, which happened in about four weeks. The ligature came away on the twentieth day. There was not the slighest hæmorrhage, and no unfavourable symptoms occurred during the cure. The limb was somewhat debilitated at first, but it has now entirely recovered its power. The ligature made use of in this case was linen shoe-thread, made small and hard, and I endeavoured to draw it so as to kill the artery in that point on which it acted. I tied with a single ligature, and did not divide the artery.

There was not the least embarrassment in the operation, except what arose from the imperfection of the needle. To remedy this in future operations of the kind, the needle should have a broad point, and be so curved, as to describe nearly half a circle in its shape.

Yale College, Dec. 16, 1820.

DESCRIPTION

OF A

NEW INSTRUMENT

FOR THE

EXTRACTION OF COINS & OTHER FOREIGN SUBSTANCES

FROM THE

ŒSOPHAGUS.*

I HAVE twice been called upon to remove coins from the throats of children. In both instances, they had descended to near the inferior extremity of the œsophagus; where the passage is a little narrowed, just before entering the stomach. Of course, they were entirely beyond the reach of forceps, or any instrument which might be employed to grasp and thus withdraw them.

"The instrument which the exigencies of the case suggested, and with which I succeeded, was unlike any thing which I have known to be employed for a similar purpose. A very few words, with the acompanying plate, will be sufficient to give an idea of it.

"The shaft of the instrument is a rod of whalebone, twenty inches in length, and of the size of a small quill.

* See cut at page 138

Half an inch from one extremity there are attached, at acute angles, like the barbs of an arrow, two wings of silver, an inch and a quarter in length, a quarter of an inch wide, and so thin as to be very elastic and flexible. The extremity, which stands off from the instrument, is convoluted so as to render it blunt, and is a little curved inward toward the shaft of the instrument. The two wings are pinned to the shaft of the instrument, and may be continued over its extremity, which should terminate with a bead, or obtuse point.

"From the position of the œsophagus between the trachea and spine, the faces of the coin present forward and back. When the instrument is thrust down the œsophagus, avoiding the glottis, as may be done without difficulty, and presenting the barbs one forward and the other back, it will pass either behind or before the coin, and the barb will spring beyond it, and catch it between itself and the shaft, when it may be very easily withdrawn. The manner in which the shaft is embraced by the œsophagus above, prevents its slipping off laterally. In both the cases alluded to, I accomplished the extraction of the coin without any difficulty, and at the first trial. In the second case, after I had once raised the coin into the mouth, the child instantly swallowed it again, though I had almost seized it with my fingers. It returned to the same place, and I again withdrew it at the first trial.

"The barbs are made so thin that should they catch in any of the follicles of the œsophagus, they would be everted sooner than rupture the membrane."

HINTS

ON THE

OPERATION OF LITHOTOMY.

BY N. R. SMITH, M. D.

Professor Nathan Smith performed the operation of Lithotomy twenty-three times. Of this number of patients, he lost three. These, however, were cases of an extremely unpromising character, the calculi being uncommonly large, and as is then usually the case, the patients much worn down with suffering. They were also men of advanced age. When we compare this result with the average of deaths in the hands of other operators, it must be admitted that Professor Smith was more than usually successful. Although he has left no memoir on this subject, yet, as I have witnessed several of his operations for stone, and am familiar with the principles which governed him in the operation, and with the mode of treatment which he adopted after the operation, I shall here offer a few comments on his practice in this disease.

The operation which Professor Smith exclusively performed was the *lateral*, and he, with one exception, invariably employed the gorget for his deep incision.

I have heard him remark, that he had, in several instances, known an error to be committed in regard to the supposed presence of a calculus in the bladder, in consequence of the sensation communicated to the hand of the surgeon through the wound, by a sabulous incrustation upon the internal surface of the bladder. He believed that in those cases in which the operation is sometimes incautiously performed, and no stone found in the bladder, the error has arisen from this circumstance.

In one instance, in which my father removed from the bladder a small mulberry calculus, the ordinary mode of sounding failed to detect the presence of a stone. The symptoms, however, were very decisive, and had existed from infancy, to the age of nineteen. Professor Smith, on once sounding him, could detect no stone, and of course was not sufficiently assured to cut for it. He used the common sound, the bladder containing a fluid; and then the catheter, to completely empty the organ, and bring the calculus in contact with the instrument. Subsequently, the symptoms continuing with unabated severity, he caused a flexible elastic-gum catheter to be tipped with a bead of silver. This he introduced into the bladder, and caused it to glide over the surface of the organ in various directions. In this way he promptly struck the stone, and proceeded to perform the operation.

In making his external incision, he used the knife with freedom, believing that mischief rarely results from too extensive an external wound, and that great inconvenience may result from the incision being so narrow as to impede the subsequent, more difficult and important steps of the operation.

The gorget which he employed, during the latter years of his practice, was that invented by Professor Physick, of Philadelphia.

The incision which he was accustomed to make in the prostate gland and neck of the bladder, was free, for the purpose of enabling him to extract the stone with facility, and with the infliction of but little irritation, or contusion, upon the parts through which it was to be drawn. There was no circumstance which he more dreaded than the tedious and difficult extraction of the stone. To obviate at once the necessity of this, and that of making a wound of dangerous extent, and which might be attended with alarming hemorrhage, he was always desirous of accomplishing that which many operators have deprecated, the fracture of the stone by the forceps. He was then enabled to remove the fragments successively, without violence.—The frequent introduction of the forceps, for this purpose, he regarded as by no means mischievous, compared with the violence necessary to extract a large stone entire. He had no fear that any portion of stone would be left to form the nucleus of a new calculus. He found it easy to search the bladder with the finger—to remove all considerable fragments with the forceps, and to wash away all sabulous particles with the syringe. He believed, too, that these substances would generally be discharged spontaneously from the bladder, through the cut, if officious endeavours were not made to close the external wound, and to prevent the escape of urine and blood.

A large stone he always endeavoured to break, and in order to effect this with facility, he devised a pair of

very strong forceps for the purpose of crushing it.—These were contrived with a screw at the extremity of the handles, for the purpose of compressing the blades with great force, when the stone was grasped. He was well aware that large stones, having their external shells formed of the phosphatic salts, are generally soft and friable.

His mode of dressing the wound, after the operation, was extremely simple. He used for this purpose merely a loose fold of linen, confined by the bandage. His after-treatment of the case was in nothing peculiar. He learned by experience, however, not to be too officious in the employment of those medicines which are regarded as lithontriptics. On one individual he operated three several times—the stone returning twice.—After the first operation, believing the calculus to consist chiefly of the lithic acid, he exhibited the alkalies. After the second operation, the calculus having more of the phosphatic character, he gave acids. After the third, he left him to the efforts of nature, and allowed him the diet which his appetite indicated, and the calculus never again formed.

Prefixed to the present article, is a plate representing an instrument which the writer has devised for the purpose of facilitating the most important of the steps of this formidable operation—the incision into the bladder. Before I describe its construction, or explain its utility, I would offer a few preliminary remarks, in relation to the principles which have governed my practice in this operation.

I have now cut for stone, on the male subject, seven times. My patients are all now living, and in good

health, nor in any instance have the symptoms of the disease as yet recurred. This gratifying success, I am very free to admit, may be rather owing to my good fortune than to any particular dexterity with which I perform the operation, or judgment with which I subsequently manage my patients. Still, however, this degree of success may entitle me to be heard on this subject, and the method which I adopt, to some consideration, as *perhaps* contributing to these happy results. The cases on which I have operated have by no means been selected ones. One was that of an individual of forty-five years, who had long suffered from the disease, and was exceedingly worn down by it—the calculus being extremely large. Another was of a lad of fifteen, who had been cut eight years before by a surgeon who found no stone in the bladder. From that time he had suffered the most agonizing torture from the disease, and when at length he was cut by me, I removed two large calculi, and found the bladder to be in an extremely diseased condition. He has perfectly recovered.

I would premise what I have to say on this subject by remarking, that if I have been more successful in this operation than most others have been in their first essays, I consider that it is not because of any thing which I have *done;* but, as I believe, because of what I have *not done.* I have ever endeavoured, in the first place, to accomplish the operation in the simplest manner possible, and have then left my patient entirely to the recuperative efforts of nature.

My two first operations were with the gorget; but I then laid aside that instrument, with a full determination

never to employ it again—not because I encountered any particular difficulty in its use, but because I found it, on the whole, to be a very awkward and inconvenient instrument, with which to make a simple incision along a grooved staff into the bladder. I became satisfied that I could use the scalpel with far less hazard of accidents, and in a measure to affect, with far more precision, the desired extent and direction of the cut.

I next employed a common scalpel, both for the external and for the deep incision; but finally fixed upon a straight, strong bistoury, with a narrow blade about four inches in length, but having a cutting edge only for an inch and a half from the point. This instrument I have generally used only for the deep incision, through the prostate; but in one instance I struck it at once into the groove of the staff, and accomplished both the external and internal incision at a single thrust.

It has always been my object to make a free external incision, but a narrow one into the neck of the bladder. Indeed, I have, in almost every instance, made an opening into the bladder so small as barely to admit the point of the finger, and have then gently dilated this by introducing the finger.

I am well aware that many surgeons are averse to such an expedient, as savouring too much of the old method by the apparatus major, and as causing laceration and contusion, which must be more mischievous than simple incision. But I would have it understood that I by no means endeavour to form an opening for the passage of the stone by this kind of dilatation, except at the point where the incision terminates in the shoulder of the bladder. I always endeavour to incise

freely the anterior portion of the prostrate, that no lacerating violence may be inflicted upon this body.

The tunics of the bladder are exceedingly distensible, and that, too, without the infliction of any considerable force. By a gentle effort, an opening which, when the bladder is but little distended with its contents, is very small, may be made one of considerable magnitude, without any laceration or contusion whatever. When this is done gently, with the soft finger, I am confident that not the least mischief results—at least there has never arisen from it the slightest unpleasant circumstance, in any one of the several cases in which I have employed it.

The advantage which I propose to myself in this method, is the avoiding to wound the blood-vessels of the bladder and prostrate. Hemorrhage from these vessels I have always been accustomed to regard as the fatal circumstance, in most cases of lithotomy which have an unhappy issue. I judged so from what I had witnessed in the practice of others, and from what I had learned in relation to it from the records of surgery.—I am confirmed in my opinion by my own experience. There is nothing which, after this operation, has given my patients so much annoyance, as the lodgment of coagula in the cavity of the bladder, and in the incision. When in the former situation, they provoke the bladder to repeated, convulsive, and often ineffectual efforts to cause their dislodgment. When acted upon by the urine, they speedily undergo chemical changes, and then inflict the most serious irritation upon the mucous surface.

When the coagula obstruct the wound through the prostrate and urethra, the urine is expelled from the

bladder by the contractions of that organ, but not being able to escape from the external wound, it is injected into the cellular tissue, and is there productive of the most fatal consequences. I have several times witnessed the agony of the patient at the time that the bladder has been labouring with often repeated and convulsive throes, to expel the internal and external coagula, from its cavity and from the wound. No remission of the most acute suffering is experienced, till the coagula are removed, either by these involuntary efforts, or by the aid of the surgeon.

Now, it is hemorrhage from the deepest vessels which are wounded—those of the bladder itself—that is most apt to pour blood into the cavity of the organ, and to block up the canal of the wound, before the blood can escape from the external opening. It is true that the surgeon can remove these coagula by a careful use of the syringe; but then, besides the prostration which is liable to occur from the continued bleeding of these vessels, and perhaps death from that circumstance, the injection of water into the wound is always painful, and is liable, itself, to occasion infinite mischief when thrown with the force which is often necessary to break up the coagula. The introduction of a sound, or other instrument, for the removal of such substances, is also productive of extreme irritation, and when there is a disposition in the parts to hemorrhage, will provoke its continuance by rendering them the seat of irritation.

It is therefore earnestly to be desired that we should avoid the necessity of these expedients, by wounding as few of the vessels in the deep portion of the cut as possible. It is unnecessary to say that, when they are

wounded, they cannot be reached for the application of the ligature. Now, by making an incision into the bladder of only brief extent, and gently dilating this with the finger, but few of these vessels will be wounded; or, if any are ruptured, in the dilatation, they will be placed in the condition of a lacerated vessel and will not bleed. A great deal depends, it is true, on the manner in which the dilatation is effected. Tissues like those of which the bladder is composed we know to be dilatable to a great extent, without inquiry. We can so dilate the anus and rectum by a gentle and continued effort, as to introduce the whole hand into that gut, without inflicting much pain or injury.

In extracting the stone through a wound thus partially dilated, it is necessary that the further dilatation made by the passage of the stone itself, should be effected in a gentle and gradual manner. The operator should endeavour to do this rather with the blades of the forceps, than with the stone which they grasp. This he can accomplish, by making the movements from side to side, which are necessary in thus dilating, in the directions of the blades of the forceps, rather than in the directions of the exposed surfaces of the stone. Thus will the necessary force be impressed upon the sides of the wound by the smooth blades of the forceps.

Nothing is so reprehensible in the surgeon, as hurry, and the affectation of despatch in these steps of the operation. A degree of dilatation which may be perfectly safe when gently and gradually effected, may be fatal laceration, when it is rudely and hastily accomplished.

After extracting the stone from the bladder, it has never been my custom to inject water or any other fluid

into the organ, for the purpose of washing away any supposed fragments of stone, or sabulous particles. I have always been able to remove such with the finger —at least, all that I deemed it necessary to remove; for I am persuaded that, if nothing be done to obstruct the wound, and hinder the escape of such substances, the bladder will itself disgorge them from the opening. To effect the removal of such substances, if water be used, it must be thrown in with force, that the particles may be washed away in its current. I have always been apprehensive that in throwing it in with this degree of violence, I should inject water into the cellular tissue of the wound. This may very easily occur, when the syringe is employed for this purpose; for the beak of the instrument is exceedingly apt to get disengaged from the bladder at the moment that the thrust with the piston is made. Even when the elastic bottle is used, the water regurgitates from the bladder with a good deal of force, and as the external wound is obstructed, it is urged with greater or less impulse into the cellular tissue.

When we have reason to believe that coagula of blood are distending the bladder, and provoking it to ineffectual contractions, it is then certainly proper that means should be employed to facilitate their escape.—Under such circumstances, I found it necessary, in one instance, to gently open the wound with the extremity of a catheter, and, afterward, to throw a stream of warm water into it with a syringe, until I had broken up the coagula which obstructed the external wound. I believe that this will generally be found sufficient, for the bladder has power enough to expel its own coagula, if the external passage be free.

In the several cases in which I have operated, there has never occurred the slightest symptom of returning calculus, although I have never been as officious in washing out the bladder, as I know many of my professional brethren to be.

It is the practice of very eminent surgeons of the present day to introduce into the bladder, through the wound, or through the urethra, a catheter or gum-elastic canula, for the purpose of facilitating the discharge of urine from the organ, without permitting it to flow along the surface of the wound. This, could it be accomplished, would certainly be a desirable object; but it appears to me that the introduction of such an instrument, will not only fail to effect this, but must necessarily cause great annoyance to the patient, and great irritation in the wound. In one instance I introduced a large gum-elastic catheter into the wound, and left it for a short time. I was careful to introduce its point fairly into the bladder, and to place it in such an attitude that it should give as little annoyance as possible. My patient, however, soon began to complain of it, as giving him great uneasiness, and begged me in the most importunate manner to remove it. I have never since employed any thing of the kind, nor shall I ever again use it, for the following reasons.

Any hard foreign substance, whatever it may be, when present in the bladder, is observed to create great irritation, and to provoke the organ to repeated efforts to affect its discharge. Certainly, then, a catheter introduced into this organ, while it is in a morbidly irritable condition—introduced through a wound—must occasion extreme irritation, and cause spasmodic contractions of the viscus.

To pass such an instrument with precision into the wound in the bladder, the finger must be introduced to conduct it to its place of destination. If this be not done, it is impossible to tell where its point may be lodged. But the contractions of the bladder, and the unavoidable movements of the body, will be exceedingly liable to urge the point of the instrument from the bladder. When this occurs, the catheter must be pushed back again by hap-hazard, into the bladder, or the finger must be introduced to conduct it. There is mischief and danger in both of these attempts. What surgeon has not experienced the difficulty of maintaining the position of an instrument in the bladder, even in its healthy condition? Unless the utmost care be taken so to secure it that the contractions of the bladder and of the urethera shall be obviated, it is perpetually slipping below the prostate. The instrument is also liable to become soon filled with mucus, or coagula, and thus to become in a short time completely obstructed, so that it shall be necessary, either to open its canal by injecting water through it, or to remove it altogether and introduce another. This necessity may occur in a few hours, so copious is the discharge of tenacious mucus, under these circumstances.

Whenever the catheter, or canula, does become obstructed, or displaced, so that it no longer conducts off the urine, infinite mischief is liable to result. Then, instead of facilitating the discharge of water, and preventing its contact with the surfaces of the cut, and its infiltration into the cellular tissue, it directly impedes the escape of the fluid by assisting to block up the external wound. And even when its canal remains

clear, it is obvious to every one that all the urine secreted can not flow through it, since it is impossible that the catheter should always reach the most depending part of the bladder. But, in regard to the wound, the passage of a small quantity of urine along its surface, if it be sufficient to wet it from time to time, is as mischievous as that of a larger quantity.

To the above objections we may add the annoyance which often results from the external extremity of the instrument being liable to be disturbed by the contact of the dressings—the unavoidable motions of the patient, and by the contact of the bed-clothing. Every touch of this kind, as it must necessarily disturb the internal extremity of the instrument, can not fail to create great irritation. The mere contact of it, also, with the surfaces of the wound, must give greater or less annoyance.

These, to me, have appeared sufficient reasons, especially after trial of the expedient, to reject every thing of this kind. But if this be productive of so much mischief, what may we not apprehend from officious attempts of some to close at once the external wound by the first intention.

This is sometimes attempted by the use of adhesive straps, and the application of compresses and the bandage. But to me it appears that such a practice is fraught with danger. To effect the immediate closure of the wound in the bladder and prostate, is obviously impossible. This must be prevented by the contact of the urine which must necessarily flow from the bladder into this part of the wound. When, therefore, by an attempt to close the external wound, the escape of that

urine which lingers in the internal wound is prevented, it must, especially when the bladder contracts, be forced into the cellular tissue in the vicinity of the parts divided, and become productive of incalculable mischief.

Immediately after the extraction of a stone, the urine, unless obstructed, continues to flow freely from the wound, for about twelve hours. At the end of this time, in consequence of the irritation produced by the cut, and especially in consequence of that produced by the flow of urine, the parts will have begun to swell.—The artificial canal will then be encroached upon and the surgeon will learn, on inquiry, that no urine passes by the wound, it being sealed by the swelling, and perhaps by the effusion of lymph. This fluid now passes (at least in many cases,) entirely by the urethera. Its passage is accompanied usually with pain and difficulty, and this period of the patient's confinement is the most perilous that occurs after the operation. If the swelling continues, and still closes the external wound, there is great danger that the urine may find its way into surrounding parts—that blood also may be confined, and that depots of matter may be formed in the vicinity of the bladder. Sometimes, it is true, where the condition of the patient is most favourable, he being young and vigorous, and when the operation has been accomplished with facility and the cut is small, the urine may continue to be discharged by the natural passage, and the wound, by the lymph which will have been effused, may be closed by the first intention to a considerable extent, so that all the evacuations of urine, pus, or blood shall take place by the urethera, and the wound be never again opened. Usually, however, at the end of

three or four days, when suppuration will have commenced in the wound, the swelling begins to subside, in consequence of the purulent secretion. The parts become relaxed and lubricated with pus, and then urine begins again to flow from the cut with perfect freedom. As soon as this occurs, the patient experiences a degree of relief, and, in most cases, the period of danger is then past. I never cease to feel painful solicitude in regard to the safety of my patient, till the urine begins, the second time, to flow freely from the wound.

Now, when an endeavour is made to close at once the external opening, it is true that sometimes it may succeed in favouring union by the first intention, and thus occasionally a very speedy cure may be obtained, but in most cases it will contribute to the very result which is most to be dreaded—a premature suppression of the flow of urine from the wound.

As regards dressings, after lithotomy—I employ none whatever, in which, however, I am not singular. I cannot conceive of what utility a compress of lint and a bandage can be, when it is once established that any thing which obstructs the wound, can be productive only of mischief. It is true that the bandage and compress will defend the external wound from the contact of the atmosphere, but of what utility is this, since the wound must continue to be bathed with urine, which is far more acrid and irritating? Indeed, the compress and bandages immediately imbibe the urine which is effused, and instead of suffering that fluid to flow off by coming in contact with but a small portion of integuments, diffuses it more widely over the surface, and keeps it in contact with the skin till often it becomes

excoriated. I, therefore, place my patient in bed, entangled in no dressing whatever, and allow him to assume whatever attitude he pleases.

Description of the Instrument (represented in the plate) designed for the purpose of facilitating the incision.

It has been my practice, as I have remarked, to use a straight bistoury for making the internal incision.—Some of the operators of London and Paris, at the present time, occasionally practice, on the young subject, and on adults whose perinæums are very thin, the bold and, as it would seem, hazardous method of plunging, at once, with the bistoury, for the groove of the staff, without first making the usual external incision, by which the groove of the staff is sought before the knife or gorget is introduced. This I have myself once practised with success and thus accomplished the operation with great celerity, the several stages of the operation all occupying not more than a minute and ten seconds. I must confess, however, that even in that case, which was one of a child, I was conscious, while executing the incision, that it was quite too much of a hap-hazard business. On the adult, this method is generally altogether inadmissible, and, indeed, no one presumes to attempt it, unless the parts are unusually thin.

If this method of making the cuts could be practised with safety and precision, in all cases, I think it must be apparent to every one that the operation would be greatly simplified—be rendered a great deal easier of of accomplishment—more expeditious—infinitely less painful to the patient, and more favourable to speedy re-

Lith. of Endicott & Swett.

covery. I know not how it may appear to other operators, but to me, the cutting with the scalpel for the groove of the staff, the introduction of the gorget, or knife, into the groove of that instrument, the anxiety which is felt in regard to its being properly fixed, and the means which are necessary to determine with certainty whether it may be pushed forward with safety, constitute the most tedious, painful, and perplexing part of the operation.

The parts on which we make our external cut, are in some degree loose and mobile, and when the knife is applied to the integuments, they glide more or less upon the subjacent parts. So also does the perinæal fascia, upon the subjacent muscles. In consequence of this, it happens that, when the membranous portion of the urethra is exposed by several successive cuts, the relative anatomy of the parts becomes confused as we proceed, and the cuts through the successive tissues are not every where parallel and coincident. This causes the wound to be irregular, complicated, and perhaps confined, although the cuts may be extensive. For the same reason, too, the operator is in infinitely more danger of inflicting unnecessary injury upon parts which it is unnecessary to incise—especially the bulb of the urethra. If we could safely cut down upon the membranous portion of the urethra with one stroke of the knife—incising at once the different tissues that are to be divided, there would not occur the same difficulty; but this cannot prudently be done.

In the method of thrusting the point of the bistoury at once upon the groove of the staff, in a manner that I have mentioned above, the design of the operator is

to transfix, instantly, the various parts which are to be divided, and to identify the cuts through each. The deep and superficial portions of the cut will then be coincident with each other, and we have a simple, straight incision, the sides of which are smoothly cut. The incision, too, is made precisely of the size which is desired, at the moment that the bistoury is withdrawn from the wound. But, as I have before remarked, this plunge of the knife is perilous and not to be attempted, even by the boldest operator, but in a few select cases.

But it occurred to me, that if any instrument could be devised which should enable the operator to do this in all cases with precision and safety, a great improvement would be made in the simplicity, safety, and celerity of the operation. After some reflection, I became persuaded that an appendage might be attached to the grooved staff in such a manner as perfectly to accomplish the object. I became persuaded that something might be attached to the handle of the staff, which, by a hinge to allow of the necessary degree of motion, could be placed in such an attitude in relation to the staff, as to furnish a perfect director which should convey the knife directly to the part of the staff which we are desirous to reach.

At length I succeeded in constructing an instrument, which accomplished my object, and which is represented in the accompanying plate. To the lower part of the handle (1) of the common grooved staff, I attached an instrument (3) of an arched form, and long enough to extend from the place of its attachment to the part of he perinæum which we design to incise. It is attached

to the staff by means of a strong hinge (2) which suffers no lateral movements, but will allow the operator to raise it high enough to pass the staff into the bladder without any impediment from the scrotum. The shaft of this appendage is made firm enough to prevent any lateral bending. In order that it may be adjusted, so as to reach any part of the perinæum which may be desired, the hinge is attached to a slide, which, in turn, is fastened to the steel portion of the handle of the instrument by a projecting piece passing through a slit in it, and fastened on the back part by a button, or a screw, or by a mere bead. This will then permit the piece appended, to be slipped up or down without its being at all weakened so as that it shall become an insecure director. This inferior extremity of the instrument (4) is bent about an inch, or more, from its extremity, backward, at a right angle, or nearly so. It will then point to the groove of the staff, a little obliquely downward. On the inferior side of the portion thus bent backward, there is a groove with flat sides, and deep enough to receive more than half of the breadth of a common-sized scalpel. The sides of this groove are made parallel to each other, and perfectly true and smooth. To this groove, a scalpel, bistoury, or whatever knife the operator designs to use, is to be adapted. The back of the latter is to be so ground and fitted that it shall apply to the groove with perfect accuracy—glide in it without impediment, and allow of no lateral play which might render its direction uncertain.

This inferior portion of the appendage to the staff—the portion in which the groove is formed for the lodge-

ment of the back of the knife—I shall call the *conductor*. The groove in this portion of the instrument points directly to the centre of the groove of the staff, and if the instrument be well made, cannot deviate from it.

I would here remark, that the staff which I prefer to employ is grooved neither directly on its dorsum, nor yet on its side, like that of Mr. Bell, but obliquely, and mid-way between these two aspects. This is to enable the operator, after having introduced his knife into the grooved staff, to give its edge an outward and downward inclination, so as to make the incision in that direction without danger of the knife being thrown out of the groove of the staff by the prominence of the edge which is on that side of the groove.

The mode of employing the instrument, modified as above, is to introduce the staff in the usual way, elevating the appendage, and then bringing it down over the scrotum, so that the director shall point toward that part of the perinæum which we design to pierce, in order to reach the membranous portion of the urethra. This portion of the instrument may, indeed, be adjusted so as to reach any part of the perinæum, and the operator has only to observe his land-marks—the tuber of the ischium----the anus---and the arch of the pubes, and then fix the appendage, so that when he presses down the director upon the parts, it shall point directly to the membranous portion of the urethra, and through those parts which we may wound with safety.

When the director is then pressed upon the parts, it is obvious that it immediately fixes them upon the dorsum of the staff. The skin, fascia, muscles &c. are compressed upon each other, and no gliding of these

organs is suffered to take place. By the pressure of the director, the parts are kept in precisely the same relations, till the incision is completed; and also, by being condenced upon the dorsum of the staff, are made more firm and steady to the thrust of the knife.

The operator presses the director upon the parts with his left hand (the handle of the staff being held by an assistant,) and taking the scalpel, or bistoury, the back of which is fitted to the director, in his right, in the usual manner, he applies it to the groove, and then pushing forward the point, thrusts it down to the groove of the staff without the possibility of its deviating so as to occasion the least solicitude in the mind of the operator. When the knife reaches the groove, and by a slight movement upward and downward the membranous portion of the urethra has been divided to some small extent, the operator, still holding the knife steadily fixed in the groove of the staff, seizes the appendage of the staff with the finger and thumb of the left hand—extends it, so as to disengage it from the back of the knife, (which, being now fixed in the groove of the staff, requires no further support from it) and carries it outward, at right angles to the staff. He may then, by holding the appendage, steady the staff while it is still held by an assistant; or he may grasp the handle of the staff in the usual way, and carry forward the knife, to make the incision of the prostate and shoulder of the bladder. In doing this, he should incline the edge of the knife obliquely outward and downward, as soon as it is introduced into the groove of the staff, and preserve that inclination until it has fairly entered the cavity of the bladder. The entrance of the knife into the organ

is known by the diminution of resistance, and by the gush of urine which will occur, if the operator has been careful that some of that fluid be retained in the bladder before commencing the operation. Then, still endeavouring to keep the point of the instrument in the groove of the staff, he abducts the handle of the knife from the staff, obliquely outward and downward, and withdraws the instrument in such a manner as to dilate freely the external portion of the wound.

The operator then lays aside the knife, and introduces the fore finger of his right hand, to ascertain whether a practicable opening has been made into the bladder. The narrowest portion of the wound he will find to be that which enters the coats of the bladder, and if the finger be constricted at any point, it will be there.—Before the staff is withdrawn, he gently urges his finger onward into the bladder, cautiously rotating it, and pressing it from side to side, in order to dilate this portion of the wound, and obviate the necessity of a wider incision, which might endanger the adjacent blood-vessels.—The wound being rendered sufficiently free to admit the finger with facility, the staff is withdrawn, and the extraction of the stone is effected in the usual manner. We have then a simple smooth cut—the edges of all the divided tissues coincident with each other—not near so liable, therefore, to suffer infiltration—and far more favourable to a speedy cure than the wound produced by the ordinary mode of dissectting down upon the membranous portion of the urethra.

the belly, there remained a degree of tumefaction and hardness in the scrotum and along the cord. This, however, gave him but little inconvenience, when he could completely succeed in returning the bowel and retaining it; but he found that the difficulty of effecting the reduction still increased, as did also the external tumour which seemed to cause the impediment.

It appeared subsequently, on the dissection of the tumour, that this external disease consisted of an enlargement of the cord and testicle, and an extreme thickening of the herniary sack, though for reasons which are by-and-by to be stated, this could not be very satisfactorily ascertained before the operation.

Some few weeks before he came under my observation, the bowel became strangulated, and he found it necessary to seek surgical aid. Dr. Worthington, an intelligent physician of Ann Arundel, was called in, and with some difficulty succeeded in effecting the reduction of the reducible part of the tumour.

He then resumed his labors, but, soon after, the bowel became again protruded and he found it impossible to return it. At intervals, also, there occurred signs of strangulation. Dr. W. was again called, but his attempts to effect the reduction were not so successful as before. The protruded viscus was evidently in some degree constricted, and the tumour of the adjacent parts had now become so great that it was impossible to employ the taxis with advantage.

Having used, without success, the means usually resorted to in such cases, and the patient remaining in a critical situation, Dr. W. sent him to the Baltimore Infirmary and placed him under my care. I found the

tumour, at this time, to be nearly of the size of an infant's head. Its form was almost sherical, and the upper part of it was firmly pressed against the abdominal ring. Near the upper part, and anteriorly, there seemed to be a small tumour implanted upon the larger one of about the size of the testicle. This was soft and elastic—more so than the testicle ordinarily is, yet from its form, size, and situation, we judged it to be this organ. The rest of the tumour was very hard and unyielding. It was impossible, by pressure, to alter its form, in any considerable degree. The inferior part of it was less hard than the anterior. It was very obvious that there was something very unusual in the morbid alterations which had taken place. We could discover nothing which, by its form and its elasticity, appeared to be a portion of intestine, nor any thing possessing the doughy feel of the omentum.

Occasionally the bowel seemed to become constricted, the passage of its contents was interrupted, and slight symptoms of strangulation supervened—the pulse being frequent, the belly painful, and the stomach nauseated. These symptoms would yield, however, to mild cathartics, horizontal posture, and fomentations, and the intestines would resume their functions.

The case was seen by Professors Potter, Hall, and Baker, in consultation with myself, and we resolved to relax the system by the abstraction of blood, rigid abstinence, and cathartics, hoping thus to be enabled to reduce the tumour by the taxis. We also directed the employment of evaporating refrigerant lotions. These endeavours were ineffectual, though carried as far as prudence would permit. The patient, after having

remained in the house for two weeks, was by no means in a condition to leave it with safety. Besides that he was totally disqualified by the magnitude of the tumour for any laborious occupation, he was in perpetual jeopardy from the occasional occurrence of slight symptoms of strangulation

My colleagues and myself, therefore, resolved that an operation should be performed, the extent and object of which should be governed by what might be ascertained, in relation to the character of the tumour, on making a free incision.

In presence of the above advisers, and other medical gentlemen, I commenced the operation by making the usual incision from a little above the external ring to the lower part of the scrotum. On carefully deepening this, I found that the whole tumour was invested by very dense and voluminous laminæ of cellular tissue.—As I cautiously incised these, I could discern no fibres of the cremaster, but thought, from the thickness of this investment, that I might perhaps be dividing that muscle. I endeavoured to lift the laminæ of tissue, and to divide them successively by inserting the director beneath them—but this I found impossible.

At length, as I proceeded with the knife, there occurred suddenly a copious gush of serous fluid. I then presumed that I had entered the cavity of the herniary sack, the external investments being less distinguishable than usual. To my surprise and perplexity, however, I found that I could not insinuate my finger into the supposed sack, in consequence of its strong adhesions, by cellular bands, to its contents. The contents, as far as they could then be examined, were evidently not in-

testines, but presented a rough surface, a firm feel, and spherical form. The size of the tumour, by the discharge of the water, was but little diminished. From the partial examination which we were then enabled to make, we conjectured that the mass within must be a portion of omentum which, in consequence of inflammation, had established numerous connexions with surrounding parts. These I therefore determined to break up as far as I could. This with some difficulty I accomplished, using the handle of the knife and the finger alternately.

It was impossible, however, to pass the finger up to the ring, and I soon discovered that we had not yet reached the interior of the sack. Nor did the anterior part of the tumour, now exposed, present the appearance of the cremaster muscle, or peritoneal covering. I examined every part of its surface with the utmost care, and at length discovered a distinct fluctuation near the middle and anterior part of the tumour. After some hesitation I determined to enter this cavity with the knife. I did so, and from this also there escaped a considerable quantity of fluid, leaving an excavation of a triangular shape, broad at the surface, and narrow at the bottom. The walls of this cavity were as firm as other parts of the tumour, nor in it could we touch any portion of a protruded bowel, or approach the abdominal ring. The cavity was more than an inch deep.—Here we were again exceedingly perplexed. I then took a strong steel director and pushed it in various directions against the walls of this excavation, in order to ascertain their strength and thickness. At length, on the mesial side of the tumour, I pushed the instrument

into a deeper cavity, situated directly behind the triangular space. I could then feel the point of the director, within the upper and inner part of the tumour. I therefore elevated the walls of the cavity on the point of the instrument, and cut down upon it. This was done on the inner side of the tumour.

I, of course, then had a considerable portion of the walls of the tumour, on the inner side, raised on the shaft of the instrument. Turning the groove of the director towards the inside, I seized a narrow bistoury, and gliding it along the groove, divided the elevated portion of the walls. Then immediately I found that I had opened the herniary sack, and that my finger was in contact with a protruded portion of intestine. The walls of the tumour, being at least the third of an inch in thickness, and very rigid, of course did not retract from the intestine. I had no difficulty, however, in passing my finger up to the ring, dilating the stricture, and returning the bowel. The true herniary sack was small, compared with the size of the tumour, and the knuckle of intestine contained in it was not large. The large portion of the tumour which was above the triangular cavity, and above and before the herniary sack, consisted of the testicle and tunica vaginalis, much diseased. At the upper and anterior part of the testicle, the tunica vaginalis seemed adherent to the tunica albuginea, beneath which, at this place, the testicle was the seat of a soft sarcomatous growth, which had distended the albuginea and produced the circumscribed soft tumour, felt before the operation, and which was supposed to be the testicle.

That part of the tunica vaginalis, which enveloped

the lower part of the testicle, was distended with water, and formed a hydrocele, the walls of which were extremely thick, and which formed a large part of the mass of the tumour.

When I had returned the protruded bowel, I found that the sack, together with the testicle and diseased tunica, formed a pendulous mass of disease which, during the several steps of the operation, had been separated from the surrounding parts. We were, therefore, apprehensive that, if left in that condition, especially as the testicle was much diseased, the process of healing would be much impeded, and perhaps entirely defeated.

By the advice of Professors Baker and Hall, I determined at once to extirpate the whole mass, by cutting across the neck of the tumour, which embraced the cord and the upper part of the sack. This was accomplished with ease. The vessels of the cord, to my suprise, were found involved in the posterior part of the neck of the sack. I say, "to my suprise," because it will be borne in mind, that the testis was situated above and in front of the herniary sack, a very unusual arrangement of parts in this disease. The mouths of these vessels are accurately represented in the engraving, (Fig. II,) they being incorporated with the walls of the sack at the lower part.

I cannot account for this arrangement but on the presumption that the cremaster muscle which, in hernia by the oblique descent, is detached from the cord by the tumour, and placed in front of it, must have drawn the testicle upward over the face of the hernia. This would the more readily occur, in this case, because of

the existence of hydrocele, for by such a tumour the cremaster muscle would be put upon the stretch, and hence it would firmly brace the tumour against the ring, as is often the case in common hydrocele.

The whole diseased mass being thus extirpated, I proceeded to secure the vessels of the cord, and then to cover the exposed parts by bringing together the integuments with interrupted sutures and adhesive straps.

Although the patient had necessarily been a long time upon the table, and had suffered severely, though with fortitude, yet he did not appear much prostrated by irritation, nor did there at any time occur any considerable degree of constitutional disturbance.

The patient was then placed quietly in bed, an opiate was administered and he was directed to be furnished with the most bland and unstimulating ailments, in small quantities. On the second day there was considerable swelling and hardness in the left iliac region, along the course of the cord, together with symptomatic fever; but there was no general swelling or tenderness of the belly. A cathartic was administered which procured a free and easy evacuation, during the passage of which he was not suffered to rise.

From this time he rapidly convalesced. The wound healed very kindly, by granulation, and there was formed at the ring a firm cicatrix, which, since that time, has been an effectual barrier against protrusions of the viscera. At the end of three weeks, he left the house perfectly well, and has ever since remained so, although engaged in laborious occupations.

Description of the Engravings.

Fig. I. Is designed to represent the front aspect of the tumour, which was oblong from above downward, and pretty uniformly convex before it was opened.— The seat of the testis is marked (1) where an incision was made into the tumour after its removal. It was here also that the elastic swelling was felt, before the operation, and which proved to be the distended coats of the testis, and the epididymis.

The cavity marked (2) is the triangular fossa, which was opened at the second stage of the operation, and which was found to contain a fluid. At the place marked (4) the side of the tumour is deficient. It was here that the director was thrust through into the deeper cavity, and the walls divided with the bistoury, inward. The anterior convexity of the tumour is marked (3).

It is to be borne in mind that this whole mass was involved in an external cyst, formed of dense cellular tissue fortified by layers of lymph. It was from this cyst that the water gushed in the first stage of the operation.

Fig. II. Exhibits the posterior aspect of the tumour. The testicle (1) is seen in the upper part, the cavity in which it is lodged being that of the tunica viginalis greatly distended and thickened, so as to retain this form in the preparation. The part of the testis here seen is that which usually presents downward and forward. The epididymis is in front. The cavity marked (2) is that of the herniary sack. Its margin, below, shews the orifices of the vessels of the cord. They are

passing beneath the tumour to ascend over its anterior face and reach the epididymis.

The drawings were accurately taken from the preparation which is in my possession. They are, however, on a reduced scale. The preparation measures, vertically, five inches—horizontally, three.

ON THE

INFLUENCE OF HEAT AND COLD,

IN THE

PRODUCTION AND CURE OF DISEASE.

BY N. R. SMITH, M. D.

On this topic I by no means design to furnish a complete and systematic treatise, but rather to call the attention of the profession to certain points which I think have not been sufficiently adverted to, and especially the remediate agency of Heat and Cold in the treatment of disease. The disorganizing effects (burning and freezing) of these agents, I shall not discuss, but confine my remarks to their less intense and more general influence on the nervous and vascular system.

The agency of atmospherical vicissitudes, in the production of disease, has long been correctly estimated.—In the etiology of almost every disease, and by almost every writer, they are accused as either the predisposing or exciting causes. But agents which exercise so powerful a control over the living system in exciting disease, must, when properly directed, be often equally efficacious in allaying it. Almost all the valuable remedies which we employ are powerful poisons, and when wisely directed, they are active and powerful in the

cure of disease, in proportion as they are, at other times, violent and destructive. Such remedies supplant disease by creating a new morbid excitement, which is inconsistent with the former, more powerful than it, and at the same time under the control of the powers of life.

From analogy, then, we should infer that heat and cold, so powerful in the production of disease, may often be trained to act powerfully as remedies, in obedience to the directing hand of the physician. But first—what is the modus operandi of vicissitudes of temperature in *producing disease?*

Heat is the most common and necessary of all the stimuli which operate on the vital qualities of the organs, to produce the active phenomina of life. Every form of animal and vegetable life seems to be, indeed, the indirect offspring of solar heat. Where the beams of the sun reach the earth with unremitting intensity throughout the year, there its vital products are the most varied and abundant; but where its rays are absent for long periods, both animal and vegetable life are languid and brief. The best illustration of the influence of heat upon the *vis insita vitalis*, is seen in the process of incubation. Here the vital principle is perfectly dormant, and would remain so until it perished, but for the influence of heat, which immediately rouses it to action.

That the living system may never be deprived of an agent so necessary to the vital functions, it is generated within the body itself: indeed, it is vital heat chiefly which acts upon the living tissues, and very rarely are they stimulated by artificial heat, or the heat of the sun

and atmosphere. Has external heat, then, no influence on the living system? It does exercise an important and constant one, but it is for the most part negative and indirect. The presence of external heat merely prevents the escape of the vital heat, and causes it to accumulate till, perhaps, the body becomes greatly oppressed with it. The living system has the power of resisting the entrance and accumulation of external heat in a suprising degree. So long as the vital functions are unimpaired, the general temperature of the body is never raised above ninety-eight degrees, although it be immersed in a medium many degrees hotter than itself. Even an egg has this power in some degree, and so also have plants. It is unnecessary to particularize the numerous experiments which have been made in relation to this subject.

When the body is placed in a cold medium, there is still as much heat generated as before, and probably more, but it passes off so rapidly that its stimulating influence is insufficient, and action is diminished. The system is by no means so capable of resisting the declension of temperature below the vital standard, as it is its rise above it. It is true that the temperature of the deeply seated vital organs will remain uniform, because, before all the other organs are chilled, life will be extinct. The surface and members, however, become cold, and their vital powers dormant. This diminution of temperature is not confined to the surface. Sometimes a portion of a limb is deeply frozen, and yet, if the proper means be employed, its vitality is restored and its integrity preserved. Now, in such a case, the temperature of the part must slowly sink from 98° to

32°. It is certain, therefore, that the temperature of some part of the living system is very often in some degree depressed below the standard of vital heat.

It appears, then, that the living system is far more capable of defending itself against excessive heat, than against excessive cold; for although some parts of the body very often sink much below the temperature of 98°, yet they never rise above it. Hence, undoubtedly, it is, that cold is, far more frequently than excessive heat, the cause of disease. This is also in part to be accounted for by the fact, that the temperature of the atmosphere is very rarely as high as that of the human body, but often ranges far below that point. Another reason too is found in the fact, that far the most sudden changes of atmospheric temperature are from heat to cold. The recurrence of warmth is always much more gradual, and is therefore less felt. The phrase "to take cold" is very common, but no one complains of having "taken heat."

Heat being the natural stimulus of the body, and that without which the vital functions cannot be exercised, it seems very suprising that cold, or the mere absence of heat, should have been regarded by some as an excitant. Such a belief appears to have been suggested by the corroborant effect which sometimes results from the sudden abstraction of redundant heat from the body. Over-stimulation by heat must, of course, produce indirect exhaustion and the loss of tone, and, consequently, the diminution of such heat will remove a debilitating influence, and thus preserve the powers of the system; but in no sense whatever can cold be regarded as a stimulus. The nature of its influence will be better understood as we proceed.

As the tissues of the body have both vital and physical qualities, it is obvious that heat must operate upon them both vitally and chemically. The irritability of the system is chiefly resident in the nerves, and, consequently, the vital influence of this agent is manifest in the increase of nervous excitement. Any excitation of the nervous system will necessarily accelerate action in all the organs, and thus we have an increased developement of vital phenomena. But if this excitement be long continued, or excessive, the organs become fatigued and no longer obedient to the influence of the nerves. We then have nervous excitement with general lassitude of the muscular and other tissues. This is the prevailing temperament of warm climates. The excitability of the nerves does not seem to be exhausted by the continued influence of heat, but is rather increased by it, because the nerves are not weakened by the physical effects of heat as we shall presently see the muscular tissue is. *Frigus nervis inimicum*, says Hippocrates—meaning that cold diminishes the energy of the nerves, while heat increases it.

Hence it is that diseases, in which morbid nervous excitement plays a conspicuous part, are mostly those of warm climates, as, for instance, tetanus, chorea, hysteria, &c. &c. Hence also one reason why this class of diseases is more incident to females, whose bodies are more influenced by artifical heat than those of males.

But the chemical influence of heat is more remarkable in its action on the muscular system. We very well know that heat expands all bodies, and that its abstraction, or cold, causes all bodies to contract to an inde-

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finite extent. The material of the living system is not exempt from this law. When, therefore, the body is operated upon by an increased degree of heat, all its tissues are expanded. Those which have a contractile property (the muscles) will have their particles in some degree removed from each other, and hence their vital and cohesive attraction will be diminished. It is probable, also, that this effect on the muscular system is, in part, owing to the influence of heat on the vital qualities of the muscles. Be this as it may, there is no doubt that excessive heat attenuates and weakens the muscular fibre, and diminishes the energy of all those organs which are essentially muscular.

Cold, on the other hand, condenses the contractile tissues, by bringing their particles into closer contact with each other, thus increasing the tone and rigidity of their fibres. The cohesive and vital attraction of the constituent parts is thus increased. This, however, is probably altogether a physical effect, for if heat be a stimulus, and this we cannot doubt, its diminution can certainly be nothing else than the diminution of a stimulus, as I have before remarked.

When, however, the system has been over-stimulated by heat, and has become physically relaxed by it, the abstraction of that excess of heat will exercise an invigorating influence, for two reasons. First, it will check the exhaustion of vital power which results from too much excitement, and thus obviate the indirect debility which will have been produced; and secondly, it will condense and give physical firmness to the contractile tissues. Indirectly, then, cold certainly is, in this way, a powerful corroborant. We shall presently

discover also, that it often, by an indirect agency, exercises an invigorating influence on the vascular system.

The texture of the extreme vessels is probably essentially muscular. At least they possess contractility in a high degree. We expect, therefore, to find them influenced by vicissitudes of temperature in the same manner as are the muscular organs generally. Many of the extreme vessels are so situated as to feel sensibly the alterations of heat and cold. Those of the skin and the extremities are thus exposed, and, as they are but parts of the general system of the circulatory organs, all of which must be dependant upon each other, the general function of the circulation must be much affected by the agents of which I am treating. When the body is subjected to the influence of a warm atmosphere, the fibre of the vessels will become relaxed; they will then yield to the *vis a tergo* of the heart, and their calibre will become increased. The quantity of blood, then contained in the capillary vessels, will become greater than ordinary. The action of the heart is, by the stimulus of heat, at the same time increased, so that, for a time, there occurs no stagnation of the circulation. But at length the blood, being in part withheld from the circulation by lingering in the dilated capillaries, and the heart not feeling its usual stimulus of distension, and being wearied by the nervous excitement which heat produces, the balance of the circulation is disturbed.—A great part of the blood becomes stagnant in the small vessels, and is withheld from the general circulation.—Congestions, hemorrhages, varicose swellings, local inflammations, and watery effusions, are liable to occur.

But when, after the relaxing influence of heat on the

surface and the extremities, the body is exposed to the impression of a cool atmosphere, the vessels of those regions are constringed. Their vital contractility, aided by the tone which they thus acquire, acts with vigor upon their contents, and they are sent back upon the heart, great vessels, and capillaries of the deep regions. The heart distended by the blood which is thus returned to it, is roused to more vigorous contractions, and thus the circulation is every where accelerated, and none of the blood is withheld from the circulation.—Thus does cold, or the abstraction of heat, indirectly invigorate the living system.

But if the cold be intense or long continued, the vessels of the exposed parts become too much constringed; they become so rigidly contracted as not only to expel their contents, but to refuse receiving the blood that is sent to them from the heart, and especially because the whole system feeling the frigorific influence, the heart does not drive its blood to the surface with its accustomed energy. The result will then be that the surface and extremities will become exangnious—the blood will accumulate in the great veins near the heart, and in the vascular tissues of the organs which are deeply seated and protected from the influence of external cold.

The skin is an extremely vascular tissue; no part of it can be pierced without the effusion of blood. The quantity of this fluid contained by the skin, at ordinary temperatures, is very great. Consequently, when it is made to recede from the surface, and, together with it, that of the extremities, it must be poured upon the deep-seated organs in such quantity as to engorge their

vessels, interrupt their functions, create venous congestions, effusions, inflammations, morbid nutrition, &c.—Whatever deep-seated organ may be at the time predisposed to disease, its vital powers feeble, and its vessels relaxed, will especially suffer from this unequal distribution of the fluids. Sometimes this organ is the brain, and then there result cerebral congestions, hemorrhages, effusions or inflammations. Sometimes the lungs are the centre of fluxion, and hence arise disorders of respiration, pleurisy, pneumonia, &c. &c. Occasionally the liver suffers in the same manner, and sometimes the mucous lining of the stomach and the intestinal canal; gastritis, dysentery, cholic or cholera morbus being produced. The effect, however, is undoubtedly in part owing to the impression made on the nerves, of which, I shall speak in another place.

It will be perceived, that I adopt, in relation to the succession of morbific causes and their effects, the opinions of Dr. Armstrong. The theory of Dr. Cullen is also similar, in many particulars, to the rationale which I have given. A spasm of the extreme vessels is certainly produced by cold, and then the train of phenomina is very similar to that described by Dr. Cullen. I do not, however, see the necessity of resorting to that vinculum of broken logic, a *vis medicatrix naturæ.* The train of causes and effects which result, seems to proceed in a necessary and very intelligible order.

It is probable that in the general circulation there is constantly taking place a kind of vibration between the heart, great vessels and viscera on the one hand, and the capillaries on the other. Even slight impressions of cold on the surface cause the blood for a time to

recede, and to fall upon the heart and viscera. The heart then re-acts, being stimulated by distension, and by its energetic effort drives the blood again into the capillaries and rouses them to the exercise of their functions. So, also, heat, when applied to the surface, causes all the vessels of the skin to become dilated and full; thus deriving blood from the great vessels, and relieving them of what may have been an oppressive load, if the surface has been for a long time constricted.

Alternations of heat and cold, then, and the vicissitudes of excitement which they produce, are by no means injurious to the vital functions, but highly salutary, the heart and the capillaries being alternately relieved of the burden of their functions, and again excited by the rush of blood. There is undoubtedly a sort of tide, or flux and re-flux of this kind, perpetually going on between the centre and the surface. In the morning, when the atmosphere is cool, and the body is uninfluenced by the various causes which create excitement, the surface is pale and the vessels contracted. The pulse, too, is smaller than at other periods. During the day, vital heat is increased by exercise; the surface of the body, also, is exposed to a warmer atmosphere.—Then, the capillary vessels become dilated and engorged, and the blood is in part withdrawn from the heart and great vessels, and accumulated in the skin and extremities. It was undoubtedly this flux and re-flux of the blood between the surface and the centre, which induced the ancients to believe, that the only circulation of the blood consisted in its flowing from the heart to the surface by day and returning at night.

The changes of temperature, which occur more or

less in all climates, are, in this way, when not extreme, exceedingly salutary to the vital functions, and not, as is the vulgar belief, generally injurious. The impression of a cool atmosphere on the surface, when not too long continued, is precisely that of a cold bath, and like it produces a re-action on the part of the heart which, indirectly, even accelerates the circulation in the capillaries on the surface. When the body is confined to a temperature perfectly uniform, the circulation is observed to become sluggish, especially in the capillaries.—There are then wanting those periods of excitement which rouse the energies of the organs, and, by opportune exercise, increase their powers.

I have already stated that cold, which may give firmness and tone to the contractile tissues, invariably obtunds the sensibilities of the nerves, and tends to produce a general torpor of that system; whereas heat, on the contrary, not only stimulates the nerves, but augments their vital sensibility.

When the body is in perfect health, and in a medium temperature, there is an equality of nervous excitement in all parts of the system, except in those organs the functions of which, are exercised periodically. The diffusion of nervous influence, however, seems to be modified by external agents in a manner very analogous to that of the free circulation of the blood. The operation of heat on the surface of the body invariably increases nervous excitement, and augments the sensibility of the nerves. In health, the nervous system seems capable of sustaining but a certain amount of nervous excitement. If it be increased preternaturally in one part of the system, it is observed generally to be dimin-

ished in other organs. When, therefore, the nerves are excited to increased action on the surface and in the extremities, by heat, nervous influence is derived from the deep organs, in a manner analogous to the derivation of blood from the deep-seated parts. The sensibilities of such organs are then temporarily diminished, and if the cause be long continued, the exercise of their functions rendered languid. I by no means undertake to explain, with precision, the mode in which this takes place. Those who adopt the belief that the brain generates, and the nerves convey, a subtile fluid, would explain what I assert by the supposition that this fluid is repelled from those nervous conduits which are near the surface, and driven inward upon the deep organs, which do not feel, except by sympathy, the vicissitudes of temperature.

However this may be, the assertion that there often occurs a repulsion of nervous excitement by the agency of cold, as well as a repulsion of blood and of vascular excitement, will I think be generally admitted. But perhaps the strongest proofs are drawn from the phenomena of disease. Whenever there occurs morbid nervous excitement (irritation) on the surface, or in the extremities, no fact is more familiar than its repulsion from such a situation upon more deeply seated organs. Such a repulsion occurs in crysipelas, the morbid excitement, by the influence of cold, being transferred from the skin to the mucous lining of the stomach or intestines, or to the brain. The same occurs, also, in gout. By the application of cold to the feet, the extreme irritation which characterizes this disease, is driven from these outworks of the system, but instantly seizes upon more deeply-seated organs.

So also, when morbid nervous excitement (irritation) has primarily seized upon the central organs, (it being perhaps produced by the sudden repulsion of healthy excitement from the surface,) the application of heat to the surface of the body will derive nervous action from the deep organs, equalize excitement, and relieve the symptoms of irritation. This often takes place in colic and other painful affections of the deep organs. In such cases we know that warm stupes, the warm bath, &c. are among the most effective means of relieving the morbid excitement within, and they do it by translating it to the surface. It would seem, in such cases, that the nervous system is capable of sustaining only a certain amount of nervous excitement. Some irritating cause has concentrated it in a particular organ. If, then, agents are employed for the purpose of forcing nervous excitement in remote parts, and those agents operate with more intensity than the primary cause, the current of nervous influence will be diverted from the deep organ, and directed to the surface. One of the most efficient agents which I employ for this purpose is heat, for, as I have before stated, it is the natural and necessary stimulus of the nerves.

It is obvious then, that heat and cold are productive of disease, as well by the morbific influence which they exercise on the nervous system, as by their more palpable action on the blood-vessels and their contents. Indeed it is undoubtedly necessary that the influence of these agents should be the same in both these systems, for when the blood is driven inward upon the vicera they are compelled to a more vigorous exercise of their

secerning functions, and consequently, require a corresponding increase of nervous energy.

It is, then, by the combined influences which heat and cold exercise on the nervous and vascular systems, that these agents by their inordinate action generate disease.

Remediate agency of Heat and Cold.

The foregoing remarks will, in some degree, prepare us to appreciate correctly the influence of atmospheric vicissitudes in the removal of diseased action. It may certainly be regarded as an axiom in medicine, that it is the first duty of the physician, when contending against disease, to direct the most careful attention to the cause of the particular affection which may demand the exercise of his therapeutic skill. This is obviously of essential importance; first, in order to enable the physician to remove an agent which will otherwise be constantly labouring to perpetuate, or re-produce the disease; secondly, because, if the disease be recent, the remedy should always be suggested by the cause—should be its direct antagonist, indeed, and produce on the system an impression that shall be inconsistent with the diseased action excited by the morbific agent.

Both heat and cold, I have shown to be prolific sources of disease. They are often both the predisposing and exciting causes of some of the most formidable affections which we treat. When, therefore, disease has resulted from the direct influence of cold, what should be the first care of the physician? Certainly to arrest as promptly as possible the operation of the cause by the substitution of heat; thus will he often break the train of morbid phenomena which are following each

other in rapid succession, and then will the sanative efforts of life be often sufficient to overcome the disease. But if disease be already established, and the restoration of the natural temperature of the surface be not sufficient to restore the equality of nervous and vascular excitement, then should we resort to a degree of heat as much above that to which the surface is accustomed, as the temperature which produced the disease may have been below it. Heat, thus applied, will produce a series of vital actions directly the reverse of that produced by the cause of the disease. If the blood has been driven from the surface to the deep organs—if nervous excitement or irritation has been translated by cold to the sensitive organs within, then will heat relieve the heart and great vessels, the liver, the lungs, brain, &c. by deriving from them the load of blood which oppresses them. The vessels of the surface will be dilated and filled, and incipient congestions and inflammations be promptly relieved. A similar revulsion will be produced in the nervous system. Nervous influence will be diverted from the centre to the surface. The sensibilities of the extreme nerves will be roused, and an equality of nervous excitement will thus be produced.

When, on the other hand, disease has resulted from the inordinate action of heat on the system, then, for similar reasons, does cold stand in the relation of a remedy. It is to be observed, however, that heat is not often the immediate, but frequently the predisposing cause of disease; hence cold, under these circumstances, is a chronic remedy. When an individual has suffered long from the debilitating influence of extreme heat, the

transition to a cool atmosphere is observed, if it be not too sudden, to be always attended with an increase of health and vigor.

When, however, as occurs in certain fevers, the surface of the body becomes preternaturally hot from the redundant evolution of vital heat from the extreme vessels, then is cold often a remedy immediately efficacious, at least in alleviating the symptoms of the disease.

I would now direct the attention of the reader to the employment of these remediate agents, heat and cold, in the treatment of particular forms of disease, and to the mode of their application; and first, the employment of heat, in the cure of those diseases which arise from the influence of cold.

Whenever there occurs a sudden transition from temperate, to extremely cold weather, the living system is always strongly impressed by the change. The more sudden the transition the less capable are the powers of life of resisting the effect. At such a period there frequently takes place a variety of diseases which every one immediately ascribes to the influence of cold. The character of these affections will very often depend on the peculiar susceptibilities of particular individuals. Some, for instance, have irritable lungs; others have digestive organs which are predisposed to disease; a third class are prone to cerebral disease; and a fourth to rheumatic inflammations of the muscles and fibrous tissues. Sometimes there will exist, at the time, an epidemic constitution of the atmosphere, (to use the phraseology of Sydenham) which predisposes the systems of nearly all individuals to the same form of epidemic disease. Cold, under these circumstances, is erely the exciting cause of disease.

Commonly, when the injurious impression of cold has been made on the surface of the body and in the extremities, there will take place, before any specific character of disease is made manifest, a general commotion of the whole nervous and vascular systems. The circulating fluids being driven inward on the heart and great vessels—upon the stomach, intestines, liver, lungs, brain, &c. &c. these organs are immediately disturbed in the exercise of their functions. The fact that digestion is at once interrupted by such disturbance of the balance of action, has undoubtedly been observed by every individual in his own person, and especially by those who labour under the occasional symptoms of dyspepsia. When such an individual immediately after taking food exposes himself to unusual cold, he soon begins to experience uneasy sensations in the stomach—flatulence, erutations, nausea, perhaps vomiting, and cholic pains. The other deep-seated organs are also disturbed, but in a less obvious manner.

The symptoms of general disorder thus produced, and which will perhaps soon result in some local, permanent, and more distinctly marked disease, may generally be at once arrested by the employment of heat applied to the surface. When the cold has not been so extreme as to freeze, or render perfectly torpid the parts exposed, so that a sudden transition will create disease in the chilled parts, the use of warm baths, of warm fomentations, frictions with warm cloths, the atmosphere of a warm room, or gradual exposure to the more intense heat of a fire, will, with surprising promptitude, interrupt the train of morbid phenomina, and restore the equilibrium of action. This result will be greatly

accelerated by the employment of warm drinks. Those which are aromatic and gently stimulant, such as tea, coffee, or the infusions of sage, balm, mint, &c. &c. will be found far more salutary than the ardent, spirituous stimuli. In the employment of the latter, the effect is, at best, equivocal. The action of the heart and arteries is, indeed, increased, but unless the constricted vessels of the surface be made simultaneously to yield, the blood will not be equally diffused on the surface, but will be driven with violence upon the organs already disposed to become engorged. The action of alcohol under these circumstances, is known to produce a feverish excitement, which is nothing else than *unequal* excitement.

But the physician is not often called upon to counteract the injurious effects of cold, till disease has become more completely developed. In the winter season of frigid climates, the organs most obnoxious to the influence of cold are the lungs. The reason is, that no other organ of the human body is exposed to such vicissitudes of temperature. When we leave the atmosphere of a warm room, and expose the body to a temperature perhaps not much above zero, the surface of the body being protected by abundant and warm garments, does not immediately feel the impression. But by respiration the atmosphere is necessarily brought into immediate contact with the lining membrane of the lungs.—Not only the mucous membrane, but the parenchyma of the lungs, feels the impression, and so also does the pleura pulmonalis, for we know that it is but at an insensible distance removed from the mucous surface. In the superficial cells their adherent surfaces are almost

in contact with each other. Consequently the extreme vicissitudes of temperature to which the lungs are exposed, may produce catarrhal inflammations, pneumonia, or pleuritis. Each of these forms of disease, when produced by cold, is ushered in by a chill, attended with a recession of blood from the surface. The more severe and the longer continued the chill, the more intense and persistent is generally the disease. The cold stage, or that of oppression, often continues long after the disease is located. It becomes then of the utmost importance, that efficient means should be promptly employed for the purpose of diverting the circulation to the surface and equalizing excitement.—Heat, it is true, when used under these circumstances, will increase the general action of the vascular system; but this evil is more than doubly counterbalanced by the promptitude with which it cuts short the forming stage. Heat, for this purpose, should be associated with moisture, for, thus applied, it stimulates less, and relaxes more. When I have once restored the warmth of the surface and the extremities, and established a reflux from the engorged organ, I have had it more completely in my power than before, to command the force of the general circulation. Indeed, before we have accomplished this, it is sometimes almost impossible to abstract blood with sufficient rapidity and in sufficient quantity, because of the sluggishness with which it circulates.—This difficulty I have several times encountered in the treatment of these affections, and after making an unsuccessful attempt, have been compelled to delay till warmth was restored to the surface.

When, from the usual re-action of the heart and great

vessels, the second stage of the disease has resulted—that of morbid excitement, heat as a remedy is of course not generally admissible. The rush of blood which then takes place to the surface, results from the stimulation of the heart, the action of which becomes greatly increased. The effect is very different from that which is produced by the stimulation of the capillaries by heat applied to the surface, for in the latter case the heart is gently excited through the medium of the extreme vessels, and the blood is solicited toward the surface, not forced by a vis-a-tergo power alone.

When general febrile excitement has taken place, heat will, for the most part, only aggravate this morbid state. But still we shall often be able, in the progress of the disease, to put this agent in requisition. Often it will be observed that, while one portion of the surface of the body is preternaturally hot, another, and most frequently that of the extremities, will be cold. While, then, we suffer a cool atmosphere to bathe one part of the surface, another may, for the important purpose of equalizing action, be cherished by warmth.

In the latter stages of the disease, when collapse has taken place, the heart and arteries having become exhausted by their ineffectual struggle, the surface again becomes cold and exanguious. Then again is heat necessary, not only for the purpose of equalizing excitement, but as a general stimulus to the system.

Sometimes the class of diseases of which I am speaking in consequence of some epidemic tendency, assumes the typhoid character. Pneumonia typhoides is a disease which has ravaged almost every part of the northern section of our country. This disease is charac-

terized by a remarkable retrocession of the fluids from the surface, by long continued and repeated rigors, with coldness of the extremities and skin. There are few diseases in which the revulsive influence of heat is more beneficial than in this. During the years 1812, 1813, 1814, when it prevailed very generally in the northern section of our country, so pre-eminent was the vapour bath found to be as a remedy in this formidable disease, and so generally was its utility known and acknowledged, that, when physicians could not be promptly obtained, it was used in the domestic way, and often with such complete success as at once to overcome the disease.

Dr. Gallup, from whom we have the most complete account of this epidemic, speaks of external warmth as a remedy second to none in importance, in the treatment of the disease. "Bleedings" he says, "without a particular regard to *external warmth* and collateral circumstances, are often injurious."* Again. "As the causes of the disease act upon the nerves, and show their morbid influence on the surface of the body, by coldness in the first stage, want of perspiration, &c. the natural indication is to restore warmth and activity to the surface as quickly as possible. I have succeeded in this often times by the use of the warm bath. It is one of the most powerful agents we can employ, while, at the same time, it is safe and agreeable. Nothing is more common than for patients to express it as a great luxury. If it does not immediately bring on sweating, it invites the circulation to the surface, relieves external chills,

*Gallup on Epidemics, p. 75.

and internal pain, and prepares the system for the remedies which are soon to follow. Where the bath cannot be obtained for immersion, rolling the patient several thicknesses in blankets, dipped in warm water, serves as a substitute."†

Nor is warmth less important as a remedy in the treatment of spotted fever—(typhus petechialis—typhus syncopalis—cold plague.) This disease seems also to be the offspring of cold operating upon an epidemic predisposition. It prevailed in New England immediately previous to the disease of which I have been speaking. It also bore to it a very strong analogy.—Like it, it was ushered in with chills and torpor. The deep organs were greatly oppressed, and the blood seemed to desert the surface. In this disease no one remedy was so efficacious as the vapour bath. Its utility was so generally known, that no sooner did the disease announce itself, than the remedy was put in requisition, whatever might be the distinguishing traits of the individual case. When the remedy came to be generally known, it robbed the epidemic of half its terrors. All the usual modes of applying warmth to the surface were also used. A medical writer who has probably had better opportunities than any other individual to become familiar with its effects, speaks of it thus—"Perhaps no remedy is better agreed on among physicians as being generally useful in this disease, than sweating, or, in other words, the application of external heat. If it is not always useful, it is in some solitary cases, where there is an abundant heat from re-action having taken

† Gallup on Epidemics, p. 300.

place in vigorous habits. At the onset of the disease, however, this remedy may be said to be always useful." "External warmth is of vast importance in keeping up the centri-fugal action of the system. If the action is allowed to recede to the centre, by neglect of external warmth, after sweating has been used with advantage, the patient is apt to be exercised with sinking distress, and will be in danger, if heat be not immediately applied."*

In typhous fever, warmth, if used, requires to be managed with the nicest discrimination. In this disease perhaps cold is a more frequent remedy than heat; yet the latter is undoubtedly of great value in the forming stage of simple typhus, and indispensable in the congestive typhus of Armstrong. This form of the disease is, indeed, nearly allied to, if not identical with spotted fever. Dr. Armstrong remarks, in regard to simple typhus, "the warm bath is a safe and efficacious remedy, and, with the means above mentioned, has considerable effect in equalizing the circulation." Again, in speaking of the stage of collapse he remarks—"This depression of the animal heat, however, occasionally comes on in the collapse of typhus, without any apparent cause; an instance of which I have witnessed in a medical gentleman, who I believe would have died if external and internal warmth had not been promptly and perseveringly employed." On the treatment of congestive typhus he says—"when the pulse still remains oppressed, and the tide of the circulation does not return to the surface, and more especially if blood has been freely

* Gallup on Epidemics, p. 251—2.

drawn, some wine with warm water should be occasionally exhibited, and the patient speedily immersed in a bath, strongly impregnated with salt, and at least about the temperature of 100°. He should remain in the bath till his skin becomes warm, and on being removed, it should be well rubbed all over with hot flannels; and he ought then to be laid in an aired bed with bottles of warm water at his feet. This plan together with tepid wine and water occasionally, will often promote a flow of blood towards the skin, and considerably relieve the viscera from congestion. Indeed, if the bath can be prepared sufficiently soon, it is far best to immerse the patient in it first, and either to bleed him while he remains in it, or immediately after he leaves it. In some very severe cases, I have found it impossible to get enough blood until a warm bath had been premised, so oppressed was the general circulation before its employment."

Dysentery is another disease which is much influenced by vicissitudes of temperature. Its predisposing cause is heat—its exciting cause is cold—suddenly suppressing the abundant cutaneous secretions, and repelling the fluids in a copious tide from the surface to the centre. Some of the older writers regarded it as a fever turned inward upon the intestines. When dysentery is excited by cold, no remedy is so efficacious in subverting it, as heat associated with moisture.—These agents reverse the series of actions produced by the morbific cause—they divert the fluids and nervous excitement to the surface. As soon as universal warmth is produced on the surface, together with perspiration, the symptoms are observed immediately to abate. The

value of this remedy is well appreciated by Mosely in his valuable work on the diseases of warm climates. It is there dwelt upon with great emphasis, and ample proof is given of its beneficial effects.

There is perhaps no disease assailing the human system, in which heat is a more indispensable remedy, than in cholera morbus. The disease, in its onset, is, I believe, invariably accompanied with a rapid recession of blood from the surface, extreme pallor, and remarkable coldness, especially of the extremities. The stomach, liver and intestines, become the centre of fluxion, toward which the circulating fluids seems to be powerfully impelled. Heat is most generally the predisposing cause of this affection, and sudden transitions from heat to cold, suppressing action on the surface, and inverting nervous and vascular excitement, are as uniformly the exciting causes. I have become thoroughly convinced of the importance of external heat in the treatment of this disease, by my own observation and experience.—It is not only in itself a powerful agent, (the remedy which nature seems to indicate) with which to assail this shivering offspring of cold, but it is an indispensable adjuvant to all other remedies. Indeed, I have rarely seen the symptoms of this malady yield to internal remedies, until, by their means or by others, warmth had been restored to the surface and extremities. This is precisely what I should anticipate, because the absence of vital warmth and action from the surface, and its accumulation in the central organs, is the very essence of the disease. A case of this affection not long since fell under my observation which proved fatal. In this instance it was found impossible by any means

to restore vital warmth to the surface. In another instance, an individual having been reduced extremely low by this disease, and the attending physicians, finding the usual remedies to be altogether inefficacious, (the usual modes of artificially warming the surface not being effectual) procured the warm skin of a recently-killed sheep, with which they enveloped the body.—This proved singularly efficacious in re-animating the surface and equalizing action. The patient was promptly relieved by it. I cannot conceive of any thing more admirably calculated than this to effect the object proposed. The temperature is precisely such as would be most agreeable to the surface. It would be conveyed, too, through the medium of moisture which could not speedily evaporate, and thereby reduce the temperature. The fleshy side being applied to the skin, the woolly covering would serve to preserve its warmth for a great length of time. Besides, there is something, I know not what, in animal warmth which cherishes far more than artificial heat. The knowledge of the fact seems to be as old as the days of King David, but the rationale we cannot explain until we shall have learnt something more of the constitution of heat. It is certain that there are different modifications, even of animal heat, which are appreciable to our senses. In certain diseases, when the hand is applied to the surface, there seems to be something acrid in the heat which is given off from the body, creating a biting sensation—hence the *calor mordax*, &c. &c. of the older authors.

In the treatment of cholera morbus, while the usual internal remedies are in preparation, I lose no time in re-animating the surface. I find it convenient to slip

the patient down toward the foot of the bed, until the legs can be dropped over the foot-rail and plunged, nearly as high as the knees, in a deep bucket of warm water, into which a handful of salt has been thrown, and perhaps a spoonful of mustard. At the same time I apply cloths wrung out in hot water to the stomach, chest and abdomen. Often I also place billets of wood, which have been plunged into hot water and wrapt in cloths, all round the body of the patient. These means soliciting the fluids to the surface, and restoring the equality of nervous excitement, will certainly, in many cases, enable our internal remedies (opium, calomel, and diffusible stimulants,) to accomplish that which they might otherwise fail promptly to effect. In such cases, the citadel of life is assailed by an impetuous enemy—the garrison is surprised and in danger of being cut off. It is true we may often foil the assailant by throwing succour into the fortress, but if we attack the enemy without, and create a diversion in favor of the vital powers, we shall most certainly achieve the victory.—Such a course is as much stronger than the simple use of internal remedies, as double elective affinity is stronger than single.

Hysteria is another of those affections which are powerfully influenced by heat and cold. Almost every practitioner has seen a form of that disease, which, at its onset, is marked by alarming and exceedingly distressing depression of the powers of life—the surface and extremities becoming cold and bloodless—the pulse almost entirely ceasing at the wrist, and the heart, lungs and great vessels being so overwhelmed by the accumulation of blood within, as to produce the utmost

degree of oppression. There is then laboured breathing, deep sighing, or moaning, and palpitation of the heart. Here, it is true, we must immediately institute the treatment applicable to hysteria, but can we expect our patient to be relieved before there is produced a reflux of the fluids to the surface? Under such circumstances I proceed, with regard to external applications, precisely as in cholera, and I have seen such practice attended with the happiest results. Recently I have treated a very extraordinary case of this kind, in which internal remedies (even the most powerful stimuli) were totally inefficacious, till warmth was excited on the surface.—The patient subsequently had several similar paroxysms which her nurses were always able to subdue by the prompt employment of these conjoined means.

In the treatment of intermittent fever, warmth is always, in the cold stage, an important palliative means, and is also often an important auxiliary in interrupting the paroxysms. Generally, the more brief we render the cold stage, by the employment of heat and other means, the less severe and protracted will be the subsequent stages. Hence most authors direct, in the cold stage, the employment of external heat. When intermittent fever has existed for a considerable length of time, and the ordinary means have been ineffectually employed, the judicious management of external warmth will be found greatly to increase the efficacy of our remedies. In such cases it is important to break the established habit of diseased action; consequently, when the hour of the expected chill approaches, I direct my patient to be placed in a warm bed—if he has, at the time any sense of chillness, to have bottles of

water applied to the feet, and perhaps around the body —I endeavour, indeed, to equalize as perfectly as possible, the excitement and heat of the body. By these means perspiration is ordinarily produced, but this we are to regard only as evidence of equal action. To aid in producing these results, I employ warm aromatic drinks. All this, however, must be accomplished without the employment of ardent stimuli, or of intense dry heat, lest we should hurry action too much, without equally diffusing it, in consequence of which, there will be danger of my producing local congestions. Moist heat is far preferable for the purpose of equalizing action and overcoming vascular obstructions, because it relaxes the cutaneous vessels, and by sympathy probably influences the deeper capillaries in a similar manner.

When by the judicious employment of heat, the equality of the circulation is preserved, the blood being no longer suffered to rush upon the deep organs, overloading and oppressing them, the tonic medicines which we employ are always observed to exercise a more salutary influence. These, then, should be renewed in the interval, and we are persuaded that, when thus seconded by the equalizing influence of warmth, a less quantity of such medicines will produce the desired effect, and with far less danger of the occurrence of permanent congestions, indurations of the viscera, &c. &c.

But external warmth is most imperiously demanded in that prostrating and often fatal form of intermittent, in which re-action takes place reluctantly, or not at all, and which often terminates in death without the occurrence of the hot stage. In such cases, internal stimuli

will often alone be found to produce no effect whatever, unless actively seconded by external warmth. An epidemic of this character occurred during the last year in Annapolis and its vicinity, and in some of the lower counties of Maryland. Many patients were lost in the cold stage, without the slighest re-action having taken place. I have been informed by intelligent medical gentlemen, that in those cases, although occasionally all remedies were ineffectual, external warmth was found in those who survived, to be a most valuable and even indispensable means.

But it is not only when there is universal coldness and pallor of the surface and extremities, that heat is to be employed in the treatment of disease. In many affections, of absolutely an inflammatory character, there is often coldness and pallor of certain parts of the system, whilst others are hot, excited and engorged.—In such cases, the important indication is to equalize excitement, and what can be more important in accomplishing this, than the employment of heat and cold, in such a manner as to equalize temperature? Thus, in certain affections of the head, accompanied with great determination of blood to that region, heat, and sense of throbbing, we often find the extremities to be cold and exanguious. It is the dictate of the plainest common sense, under these circumstances, to apply cold to the head, and heat to the extremities. If we neglect either, we neglect half of our duty. Nothing can be more important than this effort to equalize excitement, when local inflammation has taken place in a feeble and exhausted constitution. In such cases, if we divert the blood from the engorged part, and restore it to

those regions which it has for a time deserted, we produce the same effect on local inflammation, that we should by abstracting blood from the body, and that too, not by weakening the powers of the system, but by absolutely increasing them, since the blood is retained in the body, restored to its proper channels, and the organs receive their accustomed stimulation and nutrition.

In certain febrile affections, the discriminating practitioner will often find occasion to employ local warmth, even when the general aspect and sensations of the patient would indicate a considerable degree of pyrexia. Often, when the face is flushed, the chest and abdomen hot, we shall discover that the knees, feet, ankles, wrists, and hands of the patient, are excessively cold. Now, in restoring the natural warmth and excitement of these parts, it is perfectly obvious, that we shall aid in reducing the high temperature of other parts. There are cases of typhous fever requiring the general application of cold to the surface, which, with great propriety, will admit of the simultaneous application of warmth to certain parts. Indeed, is there not in almost every form of disease, unequal excitement in the system; and is it not an almost universal indication to render action uniform—a circumstance absolutely essential to health? The physician, then, should ever be ready to apply warm stupes with one hand, and ice with the other. Let me not, however, be understood to disparage other remedies; I merely claim a due consideration for the means of which we at present treat.

But warmth is, in some few instances, applicable as a remedy, even where there appears to be a morbid in-

crease of heat in a part. This we have learned empyrically, if we cannot explain it physiologically. In certain inflammations of the joints, we very well know that, when cold applications are often ineffectual in assuaging pain and allaying constitutional disturbance, these desirable ends are promptly accomplished by the employment of warm fomentations. Mr. Brodie informs us that relief may be expected from the application of warm stupes in inflammations of the joints, when the integuments are observed to be tense over the inflamed part. He supposes that ease is rendered by the relaxation, and relief of painful distension which exists. But I am inclined to think that the seat of pain is beyond the reach of any such influence from warmth and moisture. The effect must be one which is exercised through the medium of the nerves upon the deep vessels of the part. I have seen painful inflammation of the female breast, where there can not be any great tension of the integuments, relieved by the same means; also, chronic inflammations of the eyes. It will, I believe, generally be found, that the cases in which warmth is thus beneficial, are those which have existed for some time, and which have assumed an atonic character; for I by no means regard inflammation as being necessarily associated with either increased or diminished action. It is undoubtedly an altered, and irregular action; but to restore the parts to soundness it is necessary to render the degree of action as nearly natural as possible. Hence many local inflammations are assuaged by cold applications, and some by warm.

But warmth, as a local application, is more especially applicable to local irritation, or that morbid excitation

of the nerves of a part which is about to terminate in inflammation. Heat, especially when associated with moisture, as in fomentations and poultices, exercises a remarkably soothing influence upon the nerves. It relaxes the tissues of the part, and relieves the organs from painful tension, and probably exercises, also, a more direct influence on the nerves. In contused, lacerated, and gunshot wounds, the sensibility of the nerves is deadened; there takes place a suspension of their action, analogous to the suspension of the function of the blood-vessels in a chill. In a short time, reaction will take place, and a high degree of irritation, indicated by pain, will result. It is important to cut short this period of torpor in the nerves; for, in proportion to the length of its continuance, will, for the most part, be the subsequent disturbance. Warmth and moisture accomplish this in the happiest manner.—Hence the beneficial influence of poultices and fomentations after such injuries. After protracted surgical operations, also, when the wounded parts have been for a considerable time exposed to the contact of the atmosphere, to an unusual temperature, and to the contact of instruments, such applications greatly palliate the evil effects which are liable to result. When the lips of the wound have been brought as nicely in opposition as possible, I am accustomed, under such circumstances, to envelope the whole in a warm, moist poultice. Such an application will by no means interfere with union by the first intention, but rather promote it. I have heard it remarked by the late Professor Smith, of Yale college, than whom, perhaps, but few individuals of our country have been more extensively engaged in opera-

tive surgery, that after severe operations, his patients generally did better when the weather was warm.—From this he drew two precepts; first, never to decline operating (in the climate of New England) on account of the warmth of the weather; and second, always to dress warmly all wounds inflicted by the knife. I do not mean that he always applied artificial warmth, but that he enveloped the part in soft dressings.

In the treatment of burns, warmth is undoubtedly often a remedy of indispensable utility. We, however, by no means assent to its universal employment, as recommended by some, or to the employment of an irritating degree of heat. Warmth is proper immediately after the removal of the cause of injury, for the purpose of preventing the abrupt transition from heat to cold; for it is often the transition which inflicts the greater mischief. The application of cold water, or pounded ice to a burned part has always appeared to me absurd in theory, and has been observed to be injurious in practice. The first morbid state of a burned part is irritation. Often this is so intense that the sensibilities of the part are overwhelmed with it, and re-action does not immediately take place. The seat of the burn then often becomes cold and lifeless. This is especially apt to be the case, when cold applications have been judiciously employed. Warmth is then an indispensable remedy, and it may be conjoined with those articles which rouse the vital sensibilities of the part.

Modes of employing heat.—To some of the convenient modes of applying heat to the surface, I have already had occasion to allude, in the course of the

foregoing remarks: I shall not, therefore, dwell upon them at length. The most perfect medium through which warmth can be imparted to the external surface of the body is water, or the vapour of water. This fluid is a vehicle which applies itself to the whole surface of the body, with the most perfect contact—it readily imparts its heat, also, in consequence, not of its being a good conductor, but because of the free motion of its particles. The temperature of water is also managed with the greatest ease. The effect of heat thus applied is aided by the relaxing influence of moisture. For these reasons, when there is general pallor and coldness of the surface, with congestion of the deep organs, I prefer to apply warmth through the medium of the warm bath. But sometimes, even in such cases, this use of warm water will be inconvenient, or injurious, in consequence of the extreme exhaustion of the patient. At other times the necessary vessels may not be obtained promptly enough to meet the emergency of the case. When the patient is so feeble as to be moved with danger, or when motion is painful and difficult, no more effectual method can be adopted than to apply to various parts of the body, and especially the extremities, stomach, chest, &c. cloths wrung out in warm water—or, what is perhaps still better, billets of wood dipped in boiling water and wrapped in cloths. These absorb a great deal of moisture, retain their heat for a long time, and rapidly give out vapour. Heated bricks, which have been quenched in water, answer a similar purpose. When wetted cloths alone are used, we must be extremely careful that we do not suffer the dress or bed covering to become wet, or the wetted cloths to

become cool, lest, from the evaporation which will follow, a counter-effect should be produced. It was a very favourite practice in New England, in the treatment of spotted fever, to employ boughs of hemlock, immersed for a time in boiling water, and then wrapped in cloths and placed by the body of the patient.—These not only gave out aqueous vapour, but an essential oil which the plant contains in great quantity, and which is highly stimulating. When a soothing anodyne influence is desired, a decoction of poppy-heads, of hops, or other narcotic, is employed in a similar manner.

This mode of applying heat is also proper when, in consequence of the inequality of temperature in various parts, the general application of heat is deemed inadmissible. They can often be used, indeed, when it is proper to apply cold to other parts of the body. There is still another advantage, also, in our being able to continue warm stupes to the surface for a greater length of time than it is prudent to use the warm bath, and in our being able to repeat them with facility. The warm bath is observed to produce far more exhaustion than any other mode of applying warmth. This is not owing merely to the fatigue which the patient necessarily undergoes, but, I am inclined to think, in part, to the pressure exercised by the water on the surface of the body. This pressure must necessarily render respiration more difficult, and the exercise of it more fatiguing. Persons in pleasure-bathing are far less capable of muscular exertion than under other circumstances, and they are observed (I have experienced it myself) to become soon weary, or to faint from exertion too long continued. This pressure, too, must render

the capillary circulation more difficult. The power of the heart is nicely adjusted to the pressure of the atmosphere. If that pressure be diminished, as in ascending high mountains, or, partially, by the application of cupping-glasses to the surface, the capillaries are no longer so sustained as to resist the action of the heart; the blood rushes into them and they become painfully engorged. Precisely the reverse takes place when the pressure of the atmosphere is increased by immersing the body of an individual in water. The capillaries are then subjected to a pressure greater than natural—the blood is forced from them back upon the heart, which organ is then compelled to an unwonted exertion, in order to relieve itself of the load. To effect the circulation, then, the heart must necessarily labour more than under ordinary circumstances. These phenomina occur in a remarkable manner when the body is deeply immersed in water in the diving bell. We are informed that there then occurs a high degree of oppression in the chest; the surface becomes bloodless, and individuals thus situated are not capable of long continued exertion. Now, in ordinary immersion of the body, just beneath the surface, it is true that the pressure is not very great, but if any one will take the trouble to estimate the amount, he will learn that the additional pressure to which the body is subjected, is about one fortieth of the whole pressure of the atmosphere. The pressure, indeed, is thus increased in the same degree that it is decreased by ascending a moderately high mountain. Now this increase of pressure on the surface of the body is certainly a strong objection to the employment of immersion, when the patient is feeble, and

especially when there exists already a congestion of the deep organs, and an oppressed condition of the heart. It is under these circumstances, that we should resort to steam bathing. The vapour of water applies itself as closely, and as generally, to the surface of the body as water does—it requires little or no exertion on the part of the patient, and, instead of increasing the pressure of the incumbent atmosphere, it slightly diminishes it. It is for these reasons, undoubtedly, that steam bathing is observed to be far less productive of exhaustion than immersion, although continued for a much longer time.

The modes of employing the vapour bath are various, but ought always to be simple, otherwise they will certainly not be generally employed. Ordinary ingenuity will accomplish the object with great ease. Indeed, it is effected in part by means which we have already named, especially the billets of wood, hemlock boughs, bricks, &c. &c. A method practised in New England, during the prevalence of spotted fever, was to place over the body of the patient, as he lay in bed, a box of boards, open on the under side to admit the body—the edges of the open side to rest on the bed. A vessel of boiling water was then placed near the bed (commonly a tea kettle) and the nose of it being provided with a tube of some kind, the vapour was conducted under the box until a sufficient degree of heat was produced. I have practised the same thing in a manner even more simple and less annoying to the patient than this, and which will be found particularly useful when the lungs are concerned in the affection, and expectoration is difficult. It consists in placing over the patient a slight

frame, and spreading over it sheets or blankets, in such a manner as to form a canopy. Within this, and on each side of the bed, may be placed a bucket of hot water, into which heated bricks should be thrown, which will immediately produce a cloud of vapour, completely enveloping the patient. The bed-clothing should be so far removed as to give it access to the body. I have practised this method with the happiest effects in the case of a lady extremely low with inflammation of the lungs. Expectoration was almost impossible, in consequence of the extreme soreness of the lungs, and the toughness of the sputa. Copious expectoration resulted from the free inhalation of vapour, and the engorgement of the lungs seemed to be relieved by the derivation which took place to the surface.

Remediate influence of cold.—It is not my design to dwell so much at length upon the employment of cold in the treatment of disease, because, in this respect, I believe it is less important as a remedy, and because, so far as it is useful, I believe its virtues are better appreciated. I have shown that cold is a far more frequent cause of disease than heat, and that heat is often the legitimate remedy of those diseases which arise from cold. But cold being the remedy which nature indicates for those affections arising from heat, cannot of course so frequently be called into requisition. It is to be borne in mind, however, that cold is often to be employed in the treatment of those diseases which arise from cold itself, and in which excitement has taken place from re-action. Cold, too, is sometimes to be employed in cases where there is feeble action, or torpor of the system, for the purpose of producing

re-action, and actually stimulating the body. We dash cold water upon fainting individuals—we throw it upon new-born children, that seem still-born, and we sometimes employ it where there is general torpor of the system, in fevers, for the purpose of indirectly rousing the powers of life.

Since the days of Sydenham, and especially since Currie wrote and experimented on fevers, there has probably been less prejudice against the employment of cold, than against that of heat. There is a tide in the fashion of medicine, as well as "in the affairs of men." The abuse of warmth, in the treatment of disease, before the time of Sydenham, brought upon it a reproach which it has not even now entirely cast off. Cool air, cool water to the surface, and cool drinks, are, at present, more in favour.

The writers on the employment of cold in the treatment of disease are so numerous, and so recent, that it would be a supererogatory affair for me to dwell upon it. I must refer for more full information on this subject to Currie, Rush, Smith, Armstrong, &c. &c. I will merely remark, that cold is for the most part applicable to the general surface, when the whole surface manifests a temperature above the natural standard—provided the disease be one which is not liable to metastasis—and provided there exist no considerable congestion of any deep seated organ. The most remarkable diseases which demand its employment, are typhous fever and scarlatina. Cold is also sometimes applicable to the surface, even when it is far below the natural standard of temperature, for the purpose of producing re-action. I have known the cold shower-bath to be used with

very striking beneficial effects, in protracted typhus, the skin being, over the surface generally, far below the natural degree of heat---dry, harsh, and pallid; the pulse feeble and contracted—indeed, a general torpor of the whole system prevailing. A patient in that condition I have known to be taken from bed, placed on a rug, and to have three or four buckets of cold water dashed over his body. He was then promptly wrapped in warm blankets. The cold aspersion appeared to give a powerful impulse to the nervous system, the dormant powers were roused to re-action, the pulse became more vigorous, breathing more deep and free, the surface warm, and finally moist. This I have known to occur in more instances than one. The practice I learned from Drs. Powell and Pomeroy, of Burlington, in Vermont, and have been informed that they have resorted to it in many instances with success. It is a remedy, however, which should be employed with the nicest discrimination, lest there not being sufficient vital power for re-action, it should prove suddenly fatal.

When cold water is employed for the purpose of reducing temperature, as in the period of febrile excitement, I am inclined to think that it ought not to be copiously dashed cold upon the body, lest it should excite too much re-action. I prefer sponging the body frequently with tepid water, and to suffer the abstraction of heat by evaporation. This will be less apt to disturb the balance of action.

Cold water may often be applied with advantage to certain parts of the surface which are above the natural temperature, while, at the same time, other parts are morbidly cold, and require the application of warmth.

Remarks on this subject may be found in the foregoing Essay on Typhus.

The employment of cold lotions in inflammations is so familiar an expedient that it is unnecessary for me to remark upon it.

REMARKS

ON THE

TREATMENT OF THOSE CASES OF FRACTURE OF THE

CRANIUM,

IN WHICH THE

DURA MATER IS LACERATED,

AND ON THE PATHOLOGY AND TREAMENT OF HERNIA CEREBRI.

BY N. R. SMITH, M. D.

THE brain is composed of a tissue endowed with such feeble physical qualities—such imperfect tenacity, that unless effectually sustained by surrounding substances of greater firmness, it is not capable, for a moment, of retaining its form, or preserving its integrity of structure. To sustain and defend so delicate a mass, there are furnished the firm walls of the cranium accurately adapted to its form, and the tenacious envelope of the dura mater. When a portion of the cranium is broken and removed, (if it be not very extensive,) the dura mater within it is still capable of sustaining the brain at that place, though not of so effectually defending it from external violence. But, when the dura mater is also torn, and the external firm envelopes thus completely removed from the organ at that place, the delicate texture of the brain, even although the rupture may be small, is very liable to suffer disorganization,

unless means be employed which shall furnish a resistance, and yield a support, like that of the cranium and dura mater. To furnish such a substitute for these supports is a matter of extreme difficulty, and hence, with the most judicious treatment, patients who have suffered this degree of injury will, very often, ultimately perish, even although the disorganization immediately produced by the blow, should not be at once productive of serious consequences.

Various opinions have been entertained by different individuals in regard to the nature and immediate cause of *hernia cerebri*, the form of disease which is very liable to result from injuries of the above description.—Mr. Abernethy believes that it results from a kind of hemorrhage which takes place in the substance of the brain, near the part struck. "This hemorrhage," he says, "was for a time restrained by the super-incumbent brain and its membranes; but these gradually yielding to the expansive force exerted from within, and at last giving way altogether, the fluid blood oozed out and congealed upon the surface of the tumour." Mr. A. does not think these tumours to be organized. In the case detailed by him, the mass of the tumour seemed to consist of blood. This, however, has not been the aspect of the disease as often seen by others. I have myself examined a case of this affection after death—a case in which a portion of the tumour had been excised. The cadaver was brought to my dissecting room. The disease had resulted from a fracture of the os frontis, attended with laceration of the dura mater. A portion of the brain had issued from the wound. No unpleasant symptoms, however, had arisen from the injury, till

the occurrence of the hernia. Even then, indeed, he had seemed for a time to suffer no inconvenience—complaining but little of pain, and his intellectual faculties being but little disturbed. The tumour, when it had acquired considerable size, was once cut away, and, as I was informed, presented very much the aspect of the brain itself, except that it was more vascular.

Soon after this, the patient began to suffer the symptoms of cerebral irritation, and finally perished in convulsions. At the time that I examined the head, the tumour had again risen above the surface of the cranium; and it was obviously a portion of the brain itself, having undergone some degree of disorganization by mechanical violence.

Mr. Stanley, who has furnished a paper on this subject in the 8th volume of the Medico-Chirurgical Transactions, confirms the doctrine of some of the older surgeons, that these tumours are, at least in great part, protrusions of the brain itself. He found, it is true, a great deal of concomitant disease in the brain and its membranes, and seems to believe that such protrusions do not occur but in consequence of degeneration of those tissues, and a preternatural rush of blood to the brain, caused by disease.

Mr. C. Bell regards these tumours as organized excrescences, sprouting with great luxuriance from the brain and pia mater. Such tumours do undoubtedly sometimes occur, as from the extremely vascular tissues of other regions. The vessels of the pia mater, for instance, when its external investments are destroyed, may commence the process of reparation by the production of granulations, but these being unsustained

by external parts, and being forcibly injected with blood by the very vascular tissue of the pia mater, soon begin to sprout with morbid luxuriance, and the intent of nature is entirely defeated. Something of this kind may undoubtedly often occur, together with the protrusion of a portion of the brain.

I am persuaded, however, that the most frequent and fatal tumour, which thus issues from the surface of an exposed brain, is the brain itself, protruded by the unremitted impulse of the arteries of the organ. My reasons for this belief, are:—1st. We should anticipate such a result from what we know of the anatomical relations of the brain to its external coverings—the tutamina cerebri as they are termed. The integrity of the structure of the brain is not, as we see, at all dependant on its own tenacity, but entirely on the strength and firmness of the dura mater and cranium. When we remove the calvarium and dura mater from the brain, it is disorganized by its own weight. But during life, this resistance must be infinitely more necessary to the mechanical support of the organ, because it then sustains a powerful impulse from the copious streams of blood which are rushing to the brain. No organ, indeed, feels the beat of the heart so sensibly. Any one acquainted with the principles of hydraulic pressure, must form a just conception of the distension which is produced in the brain by the forcible entrance of blood by these vessels. The resistance of the vessels themselves will have but little influence in counteracting this, because, as soon as they have yielded in the least, the whole pressure will be thrown upon the brain. The pressure which the whole periphery of the brain will

then suffer, will be every where nearly equal to that which the carotid sustains.

2. True hernia of the brain sometimes occurs in children, in whom the ossification of the cranial bones is slow and imperfect; and in whom, at the same time, there exists an unusual degree of cerebral excitement and determination of blood to the head. Large tumours are sometimes formed in such cases, by the protrusion of the brain at the fontanelles, even although the dura mater is then entire. An account of this affection may be found in the Memoirs of the Royal Academy of Surgery, vol. 13. This fact would certainly induce us to believe that, when, in the more perfectly ossified head, not only the bony support is removed, but also the dura mater, the brain must often be protruded at that part, especially since the same injury which destroys these tutamina, creates excitement and increased force in the circulation.

3. If, in the dead subject, we remove a portion of the walls of the cranium with a large trephine—take away a corresponding portion of the dura mater, and then throw coarse injection into the vessels of the brain, with force continued for some little time, we can cause the brain to be in some degree protruded at the opening.

4. But we do not depend altogether upon a priori induction. It is very rare indeed that any of the forms of disease, termed hernia cerebri, occur except when there is fracture of the cranium, together with laceration of the dura mater. Sometimes, it is true, morbid vascular concrescence takes place in the substance of the brain, or in the membranes, and subsequently

causes the death or absorption of the bone and dura mater. But such tumours present a very different appearance from the true hernia cerebri, and are attended with very different phenomina. They are morbid growths, and not protrusions of the brain; at least not till they have caused the destruction of a portion of the bone and dura mater. A very large proportion even of all those excrescences which are commonly called hernia cerebri, occur only after fracture of the bone, together with laceration or death of a portion of the dura mater. The occurrence of hernia cerebri, after such an injury, is, indeed, one of the results most liable to take place, and the prognosis of the prudent surgeon always contemplates it. Such being the fact, then, we have reason to infer, that the peculiar character of the injury stands in relation of a cause to the consequence which is observed so often to follow. If hernia cerebri is the result which we uniformly dread, when the cranium and dura mater are removed, there is certainly reason to believe that this kind of injury has something to do with producing it. The bone and the dura mater exercise but little vital influence upon the brain; their offices are mechanical, they being especially designed to support that delicate organ. Consequently, when they are injured, if the brain suffers, it is because it has lost its mechanical support, and yields to the impulse of its circulating blood.

5. But the most direct evidence that such is the character of the tumour, is the appearance which a section of it presents. Many surgeons positively aver that the substance of the tumour is cerebral. I have distinctly seen it to be such. That it should appear medullary

throughout is not to be expected, because a laceration of the minute vessels of the brain, which would pour their blood into the meshes of the pia mater where it would coagulate and produce the appearance of a sanguineous tumour must take place. Indeed, it is easy to conceive that blood, thus extravasated, should often obscure the character of a tumour, essentially and primarily medullary.

It may be presumed, also, that, before the protrusion takes place, or perhaps after it, nature will have attempted the process of reparation. Granulations will have begun to sprout; but cicatrization being defeated, these granulations will be protruded together with the cerebral mass. After this, they will still continue to vegetate, and thus we have, associated with the cerebral tumour, a distinct vascular, organized excrescence.

Hernia cerebri which occurs after a fracture of the cranium (that also lacerates the dura mater without inflicting much injury upon the brain itself,) most frequently commences without evidence of vascular disease in the adjacent portion of the brain, such as can be regarded as the cause of the occurrence. Mr. Stanley, it is true, speaks of collections of matter, foci of inflammation, degenerations of texture &c. as occurring in the brain, near the base of the hernia, and probably contributing to its production. But have we not more reason to believe that these morbid phenomina are the result of the hernia, rather than its cause? Certainly we ought to anticipate from the organic derangement which the protrusion must cause, a great deal of irritation in the surrounding portions of the brain.

In most cases of hernia cerebri which have come

under my observation, the beginning of the protrusion has been the beginning of the alarming morbid phenomena. Previous to its occurrence, indeed, nothing indicating an unfavourable result has been present—no unusual pain, or cerebral excitement—no unhealthy aspect of the wound, or appearance of degeneration.—Indeed, I have known the protrusion to take place to some extent, without the occurrence of any symptom that would of itself be premonitory of the fatal consequences which are to follow. But, when the tumour has become considerable, and often very promptly after its occurrence, derangements of the cerebral functions begin to manifest themselves, and, for the most part, they keep pace with the organic derangement which is caused by the protrusion of the portion of brain.

The symptoms which mark the progress of a cerebral hernia, are—extreme restlessness—pain in the wound—coma—irregular, interrupted respiration, with deep sighing and moaning—irritability of the eye, with contraction of the pupil, in the early stages—convulsions, partial paralysis, strabismus, dilation of the pupils, towards the close. The pulse is but little affected at the commencement, but soon becomes frequent and irritated. It may, in the latter stages, become unfrequent and sluggish, as in compression of the brain. The gastric functions, and those of the secerning organs, may not be particularly affected at the beginning, but they become greatly disordered in its progress. The tongue becomes, at first, white and tremulous—subsequently it is dark and foul. The stomach is irritable, and the alvine evacuations are scanty and dark. The skin is dry, unless when bedewed with the sweat of distress.

Treatment of Hernia Cerebri.

The remediate measures employed in the treatment of this affection and the injury which conduces to it, may be resolved into,—1st. those which are used for Prevention; and, 2d. those which are subservient to the Cure of the disease.

1. I have endeavoured to show that the legitimate cause of true hernia of the brain, is the destruction of a portion of the walls of the cranium and of the dura mater—the brain being thus deprived of its accustomed support. Almost every surgeon of extensive experience will learn to dread the occurrence of the disease from a wound of this character. It is an obvious duty, then, on the part of the surgeon, to counteract, by some means, the influence of the cause, and to prevent the effect which is to be feared. The mechanical supports of the brain being removed, it would seem to be necessary that something should be supplied which may act as a substitute for the cranium and dura mater, in sustaining the brain and resisting the impulse of the blood, which now begins to circulate with increased impetus in the head. The indication is to employ something which, like the cranium, shall merely resist without making any pressure on the brain, since this, even in the slightest degree, is observed to be at once productive of the most serious consequences.

To accomplish this object, we must employ something which is hard and unyielding, and which can, at the same time, be accurately moulded and adapted to the part. Professor Nathan Smith, was in the habit of

employing, for this purpose, a plate of lead, or pewter. This he endeavoured, by hammering and bending, to fit accurately to the form of the head. First, he applied a soft pledget of lint to the vacuity in the bone----over this a thin cerecloth, and then the plate of pewter, which he bandaged securely to the head.—When the parts are placed in this condition, it is obvious that, as soon as this portion of the brain begins to rise above the general surface of the organ, it will be met and steadily resisted by the firm substance applied, before disorganization will have taken place. The plate of metal is so applied to the external surface of the head, that it can make no active pressure on the brain, but merely furnish steady resistance. The resistance which the protruding portion of the brain encounters, is very gradually increased, as the protrusion increases, and the brain gradually accommodates itself to this resistance. Were the metal applied not till after the protrusion had begun to take place; and were it then so applied as immediately to make pressure and to repress the protruding portion, we have reason to believe that it could not be endured without creating, at once, the symptoms of compression of the brain.

Professor Smith treated several cases of fracture of the cranium complicated with laceration of the dura mater, in this manner, and with success in preventing the occurrence of hernia cerebri. He, however, found it difficult to fit the plate accurately, and that it required more mechanical tact than most surgeons possess, especially as the surface of the part is then rendered irregular by the injury. It has since occur-

red to me, that, if something could be applied to the part which should at first be soft and pliable enough to adapt itself accurately to the configuration of the part, without injurious pressure upon any point, and which should then become hard, so as to accomplish the function of the bone in regard to support, the thing would be effected in a much more perfect and uniform manner. These thoughts suggested to me the employment of successive layers of strong paste-board, wet and softened in such a manner as to be easily moulded to the part. Into the vacuity, over the brain, there should first be laid a soft pledget of lint, spread with simple cerate; on the out-side of this, a thin linen cloth, broad enough to cover the whole surface of the injured part. Over this, the first piece of wet paste-board is to be laid, and it may be incised, at the edges, in various places, in order to make it adapt itself accurately. Over this, others are to be placed, in the same manner, until a sufficient number is applied to give the necessary degree of firmness when they shall have dried. Usually, three will be sufficient. Over the whole a bandage is to be applied with gentle constriction. In the course of an hour or more, the paper dries, and forms a firm shell, which will effectually perform the office of the lost portion of the cranium, so far as the mechanical support of the brain is concerned. When it becomes necessary to remove the dressings, this shell of paper may be removed at once, without altering its form, and, on cleansing and re-dressing the wound, it may be applied in precisely the same attitude as before. This application I regard as more perfect than the plate of metal, not only because it is infinitely easier to adapt it perfectly,

but because it is a great deal lighter, and less annoying to the patient.

Case.—In December 1828, there occurred to me in this city, a case which I regarded as illustrative of the utility of this apparatus. The son of Mr.———, of Howard street, æt. 7, was kicked by a horse, on the frontal bone, near the centre of the right boss. The bone was comminuted to considerable extent, and the integuments extensively lacerated. On my being called to visit him, in consultation with Drs. Chapman and Thomas, of Lexington street, we found the lad in a state of partial insensibility, though conscious of pain when the part was touched, and restless. On raising the scalp, a portion of the cranium was found to be depressed, and to present its sharp spiculæ inward, upon the dura mater. To elevate and remove this, it was necessary to apply the crown of a small traphine, and subsequently to use the Hey's saw, for removing a projecting angle. On accomplishing this, we discovered that the dura mater was lacerated to some extent, and transfixed with spiculæ of bone. The arachnoid and pia mater were broken, and a portion of the brain issued from the wound. I should here remark that the portions of bone destroyed by the blow and removed with the traphine, were about equal, in extent, to the superficies of a half-dollar. The dura mater was lacerated half across this space.

During the performance of the operation, the lad complained much, but seemed unconscious of his condition. When it was accomplished, he sunk into a comatose condition, with at first a sluggish pulse, and irregular breathing. Stitches were used, and the wound

was dressed with adhesive straps and lint. A few hours after, he suffered a convulsion. The pulse rose, bounding violently, and requiring the free and repeated use of the lancet. The next day, his nervous system was much more calm—his pulse more tranquil—the system evidently recovering from the immediate effects of the injury. The head was kept wet with evaporating lotions,—the bowels were opened by a gentle purgative. The danger from irritation and inflammation seeming now to be in some degree parried, our attention was directed to the dreaded occurrence of hernia cerebri. The head was dressed on the third day. The wound was found to present a favourable aspect; but, beneath it, the brain pulsated violently, and the parts received a powerful impulse at each throb.

There was now a probability that the case might result favourably, provided that the protrusion of the brain, and the occurrence of hernia cerebri, could be prevented. This, then, became my principal object. We dressed the wound as I have directed above—found it easy to mould the paste-board to the form of the parts, and that, when it became dry, it furnished a very perfect, firm support, that, without pressing directly on the brain, resisted effectually the throbs of the organ, and appeared to obviate all tendency to protrusion. At first, this dressing was not renewed oftener than once in two days. It gave him little or no inconvenience. In other respects, the case was treated in the usual manner—with vene-section—spare diet—perfect rest—an elevated attitude of the head—and occasional laxatives.

This boy perfectly recovered, in a brief space of time.

He is now a vigorous and healthy lad; but nature has done very little toward supplying the deficiency of the cranium, at the place of fracture. Over the whole seat of the fracture, the brain is defended and sustained only by the membranes, and by the scalp. The pulsations of the brain are obvious to the eye at a considerable distance.

It is scarcely necessary to add, that, in the preventive treatment, copious and repeated vene-section should always constitute a part of the plan. In this we have two objects in view; first, to subdue the vascular excitement which of itself may soon prove fatal; and, second, to diminish the amount of blood circulating in the brain, and to subdue the violence of the throb, which, under these circumstances, is preternaturally strong. Indeed, the increased impetus of the blood circulating in the brain, is to be regarded as one of the most important causes aiding to produce this disease.—It is, of course, impossible to give any precise instructions in regard to the quantity of blood to be taken, or the frequency of the vene-sections. This general precept may, however, be borne in mind, that in this condition of things, bleeding may be carried farther than under almost any other circumstances, and that the force of the pulse should always be kept below the standard of healthy action.

The head should be kept elevated, in order that the ingress of blood may be counteracted by gravity.—Evaporating lotions may also be employed to keep the head cool, and thus repel the fluids. This may be done without softening the paper, if we lay over it a piece of oiled silk, or brush over its external surface a little

spirit varnish. Or, we might moisten our paper, when first applied, with spirit varnish, instead of water.—Then, over the whole head, a wetted cloth may be laid, and kept constantly exposed to the atmosphere. Light—noise—conversation—every thing, indeed, which may be supposed to produce the least cerebral excitement, is carefully to be avoided.

2. When the disease has already manifested itself, our prognosis must generally be unfavourable; but yet, the many cases of subsequent recovery on record, encourage us to contend with the malady. If there has as yet taken place no remarkable degree of cerebral irritation, we need by no means despair.

When the tumour has not yet risen to a level with the external surface of the cranium, our mode of treatment is precisely the same as that which I have advised for the purpose of preventing its occurrence. Our adjuvant measures---that is the depletory means &c. are to be urged with more vigor, because the result must necessarily be fatal, unless we speedily arrest its progress.

But when the tumour has risen above the level of the external surface of the cranium, further interference on the part of the surgeon appears to be necessary, if, as is his duty, he would still labour to rescue his patient from his perilous, but not hopeless condition. The first question to be considered, is—shall the protruding mass be cut away, as has been practised by Stanley, Pring, Hill, Richerand and others? or, shall we adopt the less active measures of Larrey, who condemns all irritating means? Many cases are on record in which the former practice has been attended with happy

results. It is true, when we consider that the tumour is chiefly composed of a cerebral protrusion, that the proposal to excise the mass is at first startling. But it is at the same time to be borne in mind that this portion of the brain, in being thus protruded, has already undergone a degree of disorganization— that it is already suffering extreme irritation from the mechanical violence which is continuing to be inflicted. It is to be borne in mind also, that whatever course of treatment we may resolve to pursue, our remedies and our dressings will necessarily inflict much irritation upon the exposed mass. Indeed, if the case is to result favourably, the protruded tumour must necessarily undergo disorganization before the wound can cicatrize. That it can be pressed back again into the cavity of the cranium, is not to be expected, as such an attempt has been observed by surgeons to produce at once the symptoms of compression of the brain. This result was witnessed by Professor N. Smith, in two or three cases treated by him, and which he was accustomed to relate in his lectures. Larrey and Stanley observed the same.

There appears then to be but one alternative. We must either leave the tumour to the efforts of nature entirely, trusting that it may perish and slough away, and that the tendency to further protrusion may spontaneously cease, and cicatrization be effected; or, we must at once remove the tumour with the ligature, or the knife, level with the surface of the cranium, or below it.*

It is true that, in some rare instances, the tumour has

* The use of styptics to repress its growth, I regard as a proposal unworthy of particular notice.

spontaneously separated, and recovery has been the result. But this is a thing so little to be expected, that the interference of the surgeon seems to be imperiously demanded. If there is any thing to be accomplished by furnishing a substitute for the natural supports of the brain, at an early period, it certainly must be equally necessary at a later period. Indeed, the tendency to protrusion probably becomes stronger as the tumour increases, because, by the loss of a portion of the brain within, room is made for the ingress of more blood, and, the vessels becoming excited, the pressure is increased. But how can we furnish the necessary support to the brain, while we suffer the excresence to remain?

I am persuaded, therefore, of the propriety of at once paring away the tumour, at least as low as the external surface of the cranium. Larrey, it is true, condemns this practice as having been unsuccessful under his observation; but in the cases witnessed by him, the subsequent treatment seems not to have been adequate. In the hands of others, whose names I have mentioned, this method has been found more successful than any other, even when not associated with the means which I am about to recommend.

For the removal of the tumour, the knife is decidedly preferable to the ligature, for reasons on which it is unnecessary to dwell. When the protruded mass has been thus excised, we are advised by some to make direct pressure upon the exposed surface, not only for the purpose of repressing the growth of the tumour; but also for the purpose of forcing into the cavity of the cranium that portion which rises to the level of its external surface. Both fact and analogy are decidedly

hostile to such a practice. It is true that some degree of pressure can be exercised on the brain, provided that pressure be gradually imparted, and increased with perfect uniformity. This, when direct pressure is made on the tumour, is impossible. Larrey did not witness a single case in which such pressure could be endured with advantage. My father witnessed the trial of it in two or three cases, and found it to be attended with the most distressing consequences. In those cases in which compression is reported to have been successfully employed by Sir A. Cooper, Pring, and Stanley, we have good reason to believe that the means employed rather occasioned steady resistence, than direct pressure.—This, indeed, must have been the case in the practice of Sir A. C. because he chiefly relied upon the pressure of adhesive straps. Now these, however closely they may be applied, will invariably yield a little, and that which was pressure at first, becomes mere resistance.

Indeed, the very object which we have in view would seem at once to point out the impropriety of making actual pressure upon the tumour. The attempt to force back any portion of the protruded mass, into the sack of the dura mater, is now regarded by all as utterly futile. Sir Astley Cooper desires merely to keep its surface on a level with the external surface of the cranium, when the scalp will heal over it. If this be the object, it must certainly be unnecessary, as well as generally mischievous, to apply any thing which shall make active pressure upon the part.

I am sanguine in the belief, that the sole object of the surgeon should here be, merely to furnish something

which shall serve as a substitute for the portions of cranium and dura mater which have been removed—something hard and unyielding, accurately fitted to the part, and which, like the previous coverings, shall merely make steady resistance, but *never follow up the parts with active pressure.* This is certainly antagonizing one of the most important causes of the disease, and therefore the remedy which nature indicates. Professor N. Smith, accomplished this also, by the employment of the metallic plate, so applied that it merely came in contact with the cerebral mass, without making the least active pressure upon it. Its rigidity, and its being applied over a considerable surface, effectually protected the brain from any varying and injurious pressure of the bandage. It therefore served as a firm support to the brain, and at the same time as an effectual shield for its external protection, precisely as does the natural bone itself.

The metallic plate was applied in precisely the same manner as for the prevention of the disease. The portion protruded having been cut away as near to the surface of the brain as possible, a pledget of soft lint was first applied—then a cerecloth, and lastly the plate secured with bandages. At the time of its application, the plate made no resistence to the brain; but as the disease advanced, the protrusion encountered the firm plate, and experienced the same resistence from it that other portions of the brain did from the cranium. All the pressure or re-action, then, which could be made upon the brain, was occasioned by its own tendency to protrusion. Necessarily therefore, as the brain gradually came in contact with the resistance, the pressure

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which the brain experienced would be very slowly and uniformly increased, in precise correspondence with the growth of the tumour. Now we know that a gentle pressure, thus gradually imparted, can be endured by the brain without serious consequences. It is like that which is made upon the organ by the growth of a bony tumour within the cranium----like that which is inflicted upon the spinal marrow, by a gradually increased curvature.

This mode of treatment succeeded in my father's hands in two cases which he was accustomed to relate in his lectures, but the notes of which have unfortunately not been preserved.

For the same reason that I prefer the shield of paper in the preventive treatment, I should also prefer it here, and apply it in the same manner. I should be more careful, however, that the paper layers might nicely fit the head, and that they should be thick, and firm enough, when dry, to make steady resistence. The same means should be employed to prevent the absorption of fluids by the paper.

But perhaps a better method than either, to accomplish the object in the most perfect manner, would be to beat up paper in gum-water, to the consistence of thick pulp, (*papier maché*) and to mould this to the head. It would merely be necessary to apply the lint as before----then a thin piece of oiled silk, or plaster-cloth ----and then to apply the pulp, of such consistence that it would soon become hard. That it might the more quickly become firm and not alter its form in any degree, we might combine with it a small quantity of plaster of Paris.

The support, however it may be applied, should not be removed, if it be possible to avoid it, till the third or fourth day after its application, and then it should be quickly re-applied. It ought to be continued till cicatrization is nearly completed.

NEW MODE

OF

MAKING COUNTER-EXTENSION IN EFFECTING THE REDUCTION

OF

DISLOCATIONS OF THE SHOULDER.

BY N. R. SMITH, M. D.

WHAT surgeon of experience, in the reduction of the dislocated humerus, has not encountered the difficulty which almost always occurs in fixing the scapula, while the dislocated bone is extended? This arises from the extreme mobility of this bone, its being connected to the trunk only by syssarchosis, and gliding with great freedom in whatever direction the humerus drags or pushes it. The difficulty also arises, in part, from the fact that this bone being short, and closely applied to the thorax, is far from being accessible to our hands, and cannot, therefore, be grasped so as effectually to resist the traction which is made upon the os humeri in the attempt to effect the replacement of the dislocated bone. To a certain extent, therefore, the scapula, in such efforts, follows the head of the os humeri, and thus renders the reduction difficult; because nothing is more important than that the cavity, to which we would return the dislocated head, should be steadily fixed;—if it be not, we lose, in a great degree, the effect of our extension.

When counter-extension is made by a sheet thrown round the thorax, thus sustaining the lower part of the scapula, we are directed to support the acromian with resistance made by the hands of an assistant while the extension is made. It is very easy for the author in his closet, to indite with his pen such a direction, but he would find it a very difficult matter to execute it with his thumbs. The fact is, it is an utterly vain attempt, for as soon as the acromian is tilted a little forward by the extension, it ceases to present surface for resistance. I have often seen this attempted without any success; indeed, it is perfectly obvious that the thumbs of an assistant thus applied can accomplish nothing in resisting the force of perhaps two strong men, who are extending from the wrist or elbow.

When a band, passing over the shoulder, is attached to the margins of the folded sheet, for the purpose of sustaining the acromian, it will be found, as has occurred in every case in which I have witnessed its use, that the acromian will insinuate itself beneath it, and evade the resistance.

So also, when the arm is passed through a slit made in the sheet, or a ring of strong cloth twisted, which is designed to constrict the shoulder more closely, and thus to sustain the upper part of the scapula, the acromian, when it is necessary to make strong extension, will still insinuate itself through the ring, and the scapula be thus dragged forward;----or if this does not occur, because of the closeness of the ring, an evil will result which will more than counterbalance the advantage. The ring will constrict very forcibly the region of the joint, and, by insinuating itself under the acromian, will

press the deltoid muscle down upon the head of the bone, and thus prevent its reduction.

That which I would propose, to supersede the above means, is *counter-extension from the opposite wrist.*---This I have no doubt will at first appear startling to some of my professional brethren, but I beg them, before they condemn, to consider the following anatomical reasons for such practice.

The two scapulæ are, in their movements, very intimately associated with each other. Whenever an individual makes a strong muscular effort, even with but one of the superior extremities, he will find, by careful observation, that not only is the scapula of that side firmly braced by the contraction of the muscles which fix it, but also the one on the opposite side, and that the steady posture of the latter sensibly contributes to the firmness of the former. Let any one carefully observe the anatomical connections which the two scapulæ have with each other, and the rationale will be obvious. On the back, between the scapula, is situated the broad expansion of the trapezii muscles. At the ligamentum nuchæ, these muscles seem to arise from each other, and there play with perfect freedom over the spinous processes of the vertebræ. At this place, therefore, these two muscles, with their common tendon, form a continuous contractile band, which stretches from one scapula to the other. It is apparent then that, when one scapula is drawn directly outward from the body by an effort made on the arm of that side, the scapula of the other side will yield in some degree, and be drawn nearer to the spine, thus allowing much more freedom of motion in the shoulder on which the effort is made.

But let the scapula of the opposite side be fixed, and it will be found that, by the tension produced in the trapezii, the shoulder operated upon will be far less moveable. Let the shoulder of one side be fixed, and then let the individual endeavour to throw the other shoulder forward on the thorax, by the action of the pectoral muscles and the serratus; he will find that this movement can not be accomplished with half the freedom that it can, when the shoulder of the opposite side is allowed to move backward in a corresponding manner, toward the spine.

The scapulæ are also connected to each other above, through the medium of the cervical vertebræ. From the transverse processes of these bones, on each side, the lavator muscle descends to be inserted into the upper part of the scapula. The cervical portion of the spine is very flexible. When one scapula is forcibly dragged outward, the other not being sustained, the spine invariably bends to that side with freedom. But if the scapula of the other side be also dragged outward, then will both the lavators be made tense, and one counteracting the other, the spine will remain erect, and the scapula acted upon will yield far less. The mechanism of the rhomboid muscles is very similar.

Anteriorly, the two scapulæ are chained to each other by the intervention of the clavicles and the clavicular ligament. These being inextensible, the scapulæ can not, it is true, here influence each others motions in the same degree as in some other directions. Nevertheless, the anterior walls of the thorax, composed of the ribs and sternum, with which the clavicles are connected, are susceptible of some lateral motion, when

strongly operated upon, and when, therefore, powerful traction is made upon one arm, the scapula of that side will be more effectually sustained, if resistance be made from the opposite extremity.

It is probably not necessary for the support of the scapula of the injured side, that all the counter-extension should be made from the wrist of the sound side. My mode of employing it is to cast a folded sheet round the thorax, beneath the injured shoulder—-to carry the extremities out parallel with the sound arm, and to bandage them to the wrist. The counter-extension is then to be made by grasping the wrist and the extremities of the sheet. Extension I make from the other wrist.

The dogma of Mr. Pott, that, when extension and counter-extension are made at remote points, a great deal of the force is lost in the intervening articulations, is scarcely worthy of serious consideration. All forces imparted to the wrist must ultimately be communicated to the shoulder, without diminution, though with a degree of elasticity, which is that which we desire.

Nothing, it appears to me, can be better calculated than these antagonizing forces to place the two shoulders in their symmetrical relations. The trunk will thus be effectually sustained—the spine rendered perfectly erect, and the scapula of the injured side supported and placed in the same attitude with the opposite. The muscles around the injured joint will thus be brought into exercise in the most favourable manner to restore the symmetry of the two shoulders—-in other words, to reduce the bone. This is because, in all other respects, the two sides are now in symmetrical relation.

But when the traction is made only on one extremity, both shoulders are distorted, the spine is bent to one side, and the thorax racked. In the method which I propose, there is also this advantage—that the hands of the assistants being applied remotely from the trunk, the surgeon has free access to the shoulder joint. And it is to be observed that, in this mode, there is no band or strap which can constrict or irritate the muscles about the shoulder, and thus impede the reduction.

I place the patient in a common chair, and direct the assistants to make extension and counter-extension, at first a little inclining downward, but ultimately in nearly the horizontal direction. If this does not succeed, I place my arm firmly under the shoulder, and direct the dislocated member to be carried downward, while extension is made. The following case proves the practicability of this method.

Case. July, 1830, I was called in haste to visit L. Barney, Esq. of this city, who, in passing from the wharf on board of one of the steamboats, had fallen into the dock, and suffered a dislocation of his left shoulder. I found him in the office of my friend Dr. M. L. Knapp, which was near the scene of the accident, and to which he had been taken for relief.

Before my arrival, Dr. K. had made the usual efforts to reduce the bone, but with inadequate assistance, and his endeavours, though repeated, were unsuccessful. This was partly because of peculiar difficulty produced by the spasm of the muscles, caused by the plunge into the dock.

Dr. Knapp kindly gave me the direction of the case, though I doubt not that his own judicious efforts would have ultimately succeeded. I then directed two of my

pupils who were present, Mr. Selby and Mr. Hunt, to make counter-extension from the opposite wrist. Myself and Dr. Knapp made extension from the wrist of the injured side, at first directing it downward, but gradually raising it to the horizontal direction, and then gently depressing the wrist. On the effort being steadily continued, for two or three minutes, the bone was observed to slip easily into its place. Mr. B. has repeatedly assured me, that the effort gave him much less pain than that made in the usual way.

DESCRIPTION

OF A

SPLINT DESIGNED FOR THE

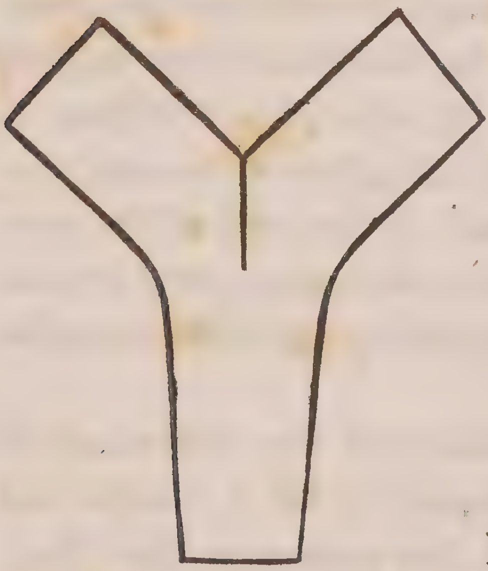
TREATMENT OF FRACTURES OF THE

OS HUMERI.

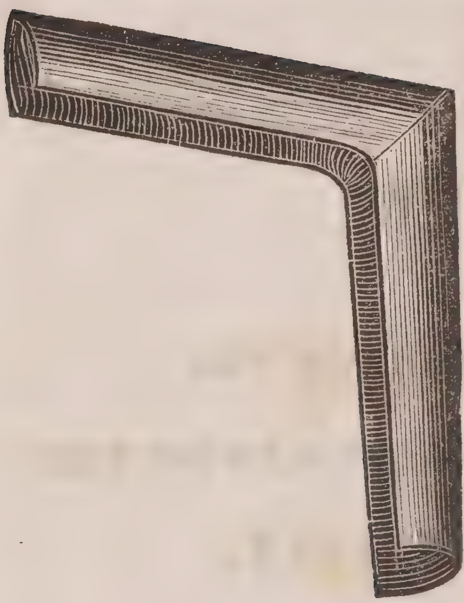
ESPECIALLY THOSE WHICH OCCUR AT THE CONDYLES.

BY N. R. SMITH. M. D.

The apparatus above-named is made of binder's board. A broad sheet of this material is cut in the shape here represented.—From the angle which the two upper projecting pieces make with each other, in the centre, the board is slit vertically down to the middle, as represented. Where this slit is made, the two lateral, projecting pieces



are, by being pushed horizontally, made to overlap and slide the one upon the other, till their margins become coincident with each other. This will immediately throw the splint into nearly the rect-angular form



—the middle portion, which is designed to fit the elbow, becoming conical. The two projecting pieces, (the lower designed to sustain the arm, and the upper, the humerus,) are now to be bent in a form to fit the convexity of the member. When the apparatus, as represented in the cut, is applied to the arm and fore-arm, it will be found to fit the member with great ease to the patient. The bandage adapts it nicely to the form of the limb, especially if it be a little moistened when applied. A splint-cloth may be placed in its hollow, and compresses used where they may seem to be necessary. The splint should be long enough to embrace the whole arm, fore-arm and hand, to the first joint of the fingers. It should be applied with the roller, from the hand to the shoulder. When used for fracture of the condyles, a compress should be placed in the bend of the arm, and the roller should make a few spiral turns around the elbow. No bandage should be directly applied to the arm or fore-arm.

The apparatus accomplishes all the indications of the angular splints recommended by Sir A. Cooper and Dr. Physick—it is neater, less cumbrous than they, more easily adapted to the limb, and occasions far less irritating pressure. The limb reposes in its concavity with perfect ease and perfect support. It is particularly applicable to the fracture of the condyles. It furn-

ishes a firm dorsum behind the limb, on which the bandage may act, and thus steadily press the condyles back into the concavity of the splint—thus preventing the formation of an angle pointing forward, the deformity most liable to occur in these injuries.

I have found it extremely useful for other fractures of the humerus, it being then both a splint and a sling—also for those of the fore-arm. I can speak with confidence of its utility, as I have used it repeatedly with marked success, and greatly to the comfort of patients. It has been used, also, with similar results, by other practitioners in this city.

Note.—The two upper pieces which overlap each other, may be fastened together with a strong needle and thread.

PRECEPTS

IN

DOMESTIC SURGERY.

BY N. R. SMITH, M. D.

It neither comports with the *honour* nor the *interest* of a liberal and philosophic profession, to withhold from those of other avocations a certain amount of correct information, relative to its principles and precepts. Medicine is now so capable of asserting its dignity as a science, that it is no longer necessary to shroud it in a veil of mystery, and thus to win for it a superstitious faith, in place of rational confidence. Mysticism can be employed as well by the ignorant as by the scientific—indeed with more zeal and effect, for the former are often the dupes of their own jugglery, or at least are not restrained by conscience. When, therefore, he who relies upon science for his means of success, disingenuously mistifies the business of his art to gain the confidence of the credulous, he is preposing the public mind to become the dupe of empyricism. Men of science often complain that they are ill requited for their intellectual toil, when empyricism is seen to win from them the public confidence. They do not reflect, however, that this is chiefly because medical men have first obscured their art, and deluded the community in-

to the belief that in it there is "some *charm*, some conjuration, or some mighty magic." They are disappointed, therefore, when they learn somewhat of the limited resources of our art, and readily transfer their faith to those who are ignorant, or dishonest enough to keep up the delusion. Men are indignant when we prescribe means as simple as the waters of Jordan, instead of smiting upon the part and uttering some technical incantation.

To disinthral the public mind, medical men must cast off the whole garb of the charlatan, nor suffer any thing to remain which shall confound medical philosophy with empyricism. The profession must seize every opportunity to educate the community in the first principles of medicine, and when this is accomplished, the medical scholar may, in public opinion, safely rest his ripened claims to reputation, which now is often wrested from him, when he will not resort to the degrading tricks of the charlatan to maintain it.

Undoubtedly the ingenuous part of our profession suffer most severely, not from the itinerant nostrum-monger, but from the scientific empyric—that member of the profession who avails himself of that which science reveals, but, in practice, associates it with the artifice of the charlatan. Splendid instances of success achieved by such, can always be pointed out, and against them the honest part of the profession can vindicate itself only by educating the community in the true character of the science of medicine.

In addressing the following precepts, therefore, to the educated public, I conceive that I am indirectly subserving the true interests of my profession, while my

direct object is the instruction of others. I consider, also, that it is an urgent dictate of humanity to furnish the community with a certain amount of knowledge, particularly in surgery, because at this time they are singularly ignorant of its simplest principles—because infinite mischief and suffering is created by its abuses—and because the maladies which demand the surgeon, are such as brook not a moment's delay. Accidents often occur which prove immediately fatal, when the knowledge of a single fact would enable any individual at least to arrest the hand of death till more efficient aid could be procured.

Treatment of Suspended Animation, or Extreme Prostration from injury produced by Blows or Falls.

It is very seldom that a surgeon can be obtained to direct the first steps which are taken for the relief of an individual who is struck sensless, either by any shock which the body may have suffered, or local injury which may have been inflicted upon an important organ. It is certainly desirable, then, that the knowledge of the means necessary at such a moment should be as generally diffused as possible. Those means, at the present time, are certainly not generally known to the community;—on the contrary, exceedingly injurious expedients are generally resorted to.

We will suppose the case of an individual who has fallen from a height, and whose body, although there may be no fracture or obvious contusion, has suffered so severe a shock that the heart almost ceases to beat, causing the pulse to fail, or become feeble—the coun-

tenance pallid—consiousness suspended. Although humanity dictates that which is done for the relief of the sufferer, yet, under such circumstances, I have again and again had occasion to observe, that the officiousness of the by-standers generally adds to his suffering and peril. The first thing usually done is, to raise him into the sitting posture. Nothing, however, could be more injudicious. The horizontal posture is that which the state of the system then demands. For restoration, it is necessary that the blood should flow to the brain, and when the patient is lying with the upper part of the body low, the first feeble beats of the heart will throw blood into the head; but if he be raised erect, the heart has the gravity of the blood to overcome, and the same power in its beat will not send blood to the brain. The patient, indeed, is in a kind of fainting fit, and every one has observed that when, in bleeding, a person faints, he is promptly restored by throwing his chair back upon the floor. If he is raised too soon, the fainting recurs.

In the hasty endeavours to raise him, the body is also contorted, the chest confined, and breathing constrained.

If then the sufferer be found lying upon a dry and level surface, he should merely be placed on his back, and be suffered for a few minutes to repose, without the slightest motion. If, however, the surface on which he lies be broken or wet; or if the air to which he is exposed be severely cold, he must be conveyed to the nearest shelter, great care being taken, while doing it, to keep him still in the horizontal posture, and to avoid confining his chest. If cold, he is then to be covered

with warm cloths. Should the signs of returning animation be faint, a small quantity of cold water may be dashed in the face; the nostrils and lips may be wet with vinegar, or hortshorne, if at hand. Gentle friction on the extremities may also be used. When the patient can at length swallow, the pressing danger is usually past, unless there be disorganization of some important structure. Officious attempts to convey stimulating fluids into the stomach, before the patient has the power of swallowing, interrupt returning respiration, and are productive of infinite mischief. The first thing swallowed should be cold water, this being the cordial which the patient invariably desires as soon as he becomes conscious of his wants. If the powers of life still remain feeble, some cordial, wine, or a few drops of hartshorn in water, may be employed.

There is perhaps no popular error which is more general, or more productive of mischief under these circumstances, than the use of the lancet. No conviction can be stronger than that of a great part of the community that bleeding is absolutely indispensible in such cases. The error has undoubtedly been derived by the people from our predecessors in surgery. Almost every neighborhood has some individual capable of using the lancet, and, in cases like the above, if medical aid be not at hand, his skill is always put in requisition.

Foregoing facts and a moments reflection must convince even those not educated in medicine, that, when the vital flame is flickering and doubtful of existence, nothing can be more certain to extinguish it, than the sudden abstraction of blood. It is an agent, indeed, which is capable of producing the very condition of the

system which we desire to remedy. There is a period, it is true, after injuries such as I have described, when bleeding is imperiously demanded, but this is the period at which re-action has taken place, and increased excitement has resulted—effusion of blood into the injured parts, or inflammation being threatened. But the treatment of this condition belongs not to domestic surgery, either from propriety or of necessity.

So strong and general is the common prejudice in favour of employing the lancet in cases such as I have described, that the surgical practitioner is almost always assailed with the importunities of the by-standers for its immediate employment. The young surgeon is thus sometimes, either urged to act contrary to his own judgement, or, by appearing to temporise, forfeits the confidence of the throng, every one of whom affects to be as wise in regard to medicine and surgery, as in relation to politics and the weather.

Fortunately, blood usually refuses to flow in this condition of the system; but if the opening of the vein be successful, then will nature, in her struggle to re-animate the body, be compelled to contend against both the injury and the intended remedy, and when perhaps just able to resist the enemy with effect, she is overwhelmed by the mistaken kindness of an injudicious friend. To her, then, the cut of the lancet is "the unkindest cut of all."

Means of temporarily Arresting the Flow of Blood from Wounds of Large Vessels.

As many to whom the following precepts are addressed may be unacquainted with the circulation of the blood, it is necessary to observe that the arteries are those vessels which receive the blood from the heart, by the impulse of that organ, and convey it in rapid currents to every part of the body. The veins are those vessels which take the blood from the extreme arteries, and bring it back, in less rapid streams, to the heart.

When a large artery is wounded, blood rushes from it with great rapidity, often spirting to the distance of many feet from the body. An artery does not bleed with a steady stream, but the blood leaps from it by successive impulses, which correspond to the beats of the heart, though in the intervals the stream is still continued with less force. Blood which flows from an artery is also of a bright florid hue.

From a wounded vein, blood flows with a uniform, and far less impetuous stream. Sometimes, however, when a vein lies over an artery, the current is slightly influenced by its beats. The blood which flows from it is of a very dark red hue.

Bleeding from veins is very rarely fatal, but a wound of a large artery is extremely dangerous. Often, before a surgeon can be procured, the patient will have expired. It is earnestly to be desired, therefore, that every one's education should embrace so much of the practice of surgery as shall enable him to use the simple means which are necessary to arrest the flow of blood till professional aid can be procured. Were

such knowledge general, valued lives would undoubtly often be rescued from the effects of injuries so generally fatal for want of prompt medical aid.

When arterial blood is seen to gush from a deep wound in the thigh, leg, or arm, with alarming rapidity, the by-stander should reflect that the blood which flows is that which is passing from the body into the limb. Let him then expose the member as quickly as possible by tearing up the garment---snatch his handkerchief from his pocket and tie it loosely, though with a firm knot, around the limb above the wound. Then let him take a small stick, four or five inches in length, or the handle of his pen-knife, which will answer perfectly well—put it under the handkerchief, and then twist it round several times, till the limb is tightly bound by the handkerchief, which will thus be twisted upon the limb. Almost any degree of force may be exerted in this way, and a slight effort will be sufficient so to constrict the limb that the effusion of blood shall for the time cease. It is to be borne in mind, however, that these means can only temporarily arrest the bleeding. As it completely interrupts the circulation of the blood, both in the arteries and veins, its long-continued application would endanger the vitality of the limb. By it, therefore, time only is gained till the surgeon can be procured, in which there should be no delay. During the application of the handkerchief, it should not be drawn with unnecessary tightness. After it has been a short time applied, it should be slightly relaxed to ascertain if the bleeding will return, as their often forms a clot in the wound which aids the effect of the ligature.

When the wounded parts are laid open by a broad cut, and the orifice of the artery can be seen, with the blood spouting from it, it should be known that a simple thread, tied firmly upon it, will effectually and permanently command the bleeding. When, therefore, an individual who knows this fact can be firm enough to act with decision in such a case, or when a surgeon can not be obtained, he may seize the vessel with his fingers, and, dragging it a little out, direct some one to tie a thread around it. Or, if it cannot be grasped with the fingers, he may take a darning needle, anneal it in the fire, and bend the point. With this he may seize and so drag the artery outward that the ligature can be applied.

When a bleeding artery lies upon a bone, the bleeding can easily be commanded by firm pressure made with the point of the finger, or some small and firm body. The mere pinching together the lips of the wound, however, will do no good, but rather occasion mischief, because the blood will then be forced into the parts below the skin. Bleeding from an artery in the temple, or on the head, may easily be commanded by pressure—also on the top of the foot—often on the wrist. The surgeon, however, should, in all such cases, be called as quickly as possible; but if he cannot be procured, the pressure may be kept up by first applying a small roll of linen to the artery; then a broader one over this, and then a third still broader. These are to be pressed firmly upon the artery by a bandage rolled many times round the part. But if it be not possible, either from the rapidity of the bleeding, or because the means are not at hand, or because the

wounded vessel is not upon one of the limbs, to employ with effect either the tourniquet (the handkerchief) or the ligature, the by-stander should have sufficient presence of mind to expose the wound from which blood is rushing, and, if the wound be deep and narrow, such as is made by the thrust of a knife, or dirk, or by a musket shot, let him cover the orifice as closely as possible with the extremity or ball of the thumb.

To cover the part with cloths and bandages, to hide the mischief, and then to attempt pressure, as is usually done in the trepidation of the moment, is generally altogether ineffectual. The force is then more diffused over the surface, and is less directly opposed to the orifice of the wound.

If the pressure be continued for a time, coagulation will take place within the wound, and an aneurism often be formed, which must be submitted to the management of the surgeon. I have known a patient to perish from such a wound, when the application of a finger over the orifice would have gained time enough for the successful exercise of the skill of the surgeon.

When blood flows from a wounded vein, it may, under some circumstances, be necessary to use efficient means to arrest the bleeding. Sometimes, when a vein has been opened in the arm, the orifice being large, it may, even after some hours, again bleed with rapidity. This is often caused by the bandage getting slipped above the elbow, in consequence of which it binds the veins, and causes them to bleed as when the arm is ligated for the purpose of taking blood. When this occurs, the member should be exposed, and the bandage, or any part of the dress which may constrict

the arm, removed. A small roll of linen, of the thickness and breadth of the finger, should then be laid upon the vein, and bound firmly upon it by a bandage, which should be drawn more tightly below than above the elbow. Motion of the arm should then be avoided Wounds of veins in other regions of the body are to be treated in the same manner.

Treatment of Wounds inflicted by cutting instruments.

Unquestionably the most valuable acquistion of modern surgery, is the method at present employed by intelligent surgeons in the treatment of simple wounds. But although it is now near fifty years since it has been generally adopted by English surgeons, and although it is extremely simple, rational, and intelligible, it is by no means generally known and approved by those who are uneducated in medicine. Indeed its very simplicity is perhaps the reason why it is not generally received.

After some thousands of years' experience had elapsed—after almost every substance which the three kingdoms of nature can furnish had been tested, and balsams, vulneraries, styptics &c. without number, had tortured the wounds of sufferers for ages, it was at length discovered that there is no such thing as a *healing virtue* in any remedy—that the healing of a wound is not the result of any application; that it is, in short, nothing but the work of *nature*—of a restorative principle identified with the principles of life, and by which each organ is, to a certain extent, enabled to repair the mischiefs of injury and disease.

When a part wounded has been previously in perfect soundness—when the general health of the sufferer has also been perfect, and no untoward circumstance defeats her admirable work, nature scorns assistance from our hands. Nothing can then be applied to the wound which will exercise the slightest influence in accelerating the recuperative process. A certain series of changes must necessarily take place in the part, before it can be restored to soundness, and these changes must necessarily occupy a certain time. If irritating medicaments are applied, with a design to hurry this, it is with precisely the same absurdity with which we should administer bark and wine to a person in perfect health, after having taken food, in order to hurry the process of digestion. And yet I very well know that with many I shall contend unsuccessfully against an ancient prejudice. "What!" say they, "nothing in nature that is healing? no such thing as a balsam? 'no balm in Gilead?' a fig, then, for your science of Surgery. Have I not cured wounds on my own person a hundred times with balsam apple, or burnt sugar, or rum and red-pepper, and other soothing remedies?" True; but have you ever tried the experiment of applying nothing? "No, for then I should have practised as absurdly as yourself."

The belief in the healing virtues of certain plants, and other simples, is so wrought into our language, that it is impressed upon the mind with the first lessons of childhood. The phrases "healing balsam," "soothing balm," are uttered in prose, and sung in verse. We shall spoil, it is true, a thousand beautiful metaphors, by establishing the truth; but it is better that we should mar

the works of man, than those of God. The story of the good Samaritan, who poured oil and wine into the wounds of the stranger, has, no doubt, caused many a wound to be tortured. But holy writ was given neither to instruct us in Medicine, nor in Astronomy.

But although we reject the farrago of herbs, and balms, and balsams, yet there is still much for the hand of the surgeon to accomplish. In the first place, great good may be effected in removing impediments which might defeat the intent of nature; second, by placing the parts in a state of repose, and in the most favourable attitude for the restorative process; third, by checking, or exciting, those efforts, when they appear to be too energetic, or too feeble.

1. The first of these objects is effected by removing dirt and all foreign substances from the wound—by staunching the blood by the modes advised above, and removing the masses of coagulated blood which keep open and irritate the wound.

2. To effect the second, it is necessary to bring the lips of the wound as closely together as possible, adapting part to part as they were situated before they were divided. This can often be accomplished by placing a little dry lint directly upon the wound—pressing together the sides of it with the hand, and then permanently sustaining them by passing a bandage around the part.—The lint imbibes a little of the blood,—soon dries—adheres strongly to the skin, and aids to sustain the lips of the wound.

But this is more perfectly effected by using straps of adhesive plaster half an inch wide. These are warmed

by the fire and then, the lips of the wound being pressed together, are to be applied closely to the skin. Shoemaker's wax, thinly spread upon strong linen, will answer the purpose sufficiently well. The injured part should then be covered with a folded cloth and a bandage, so applied as to protect it from the contact of the air, while the body should be so placed that the part shall be as perfectly at rest as possible, and no strain be made upon it. This dressing should not be disturbed till the fourth day. The bandage may then be softened with warm water, and removed, the wound cleansed and dressed with a salve made of bees-wax, 1 part, lard, 3 parts. It will be found, at the end of this time, that, where the surfaces are in contact, they have almost every where at once grown together, by what surgeons call the first *intention*, or the first effort of nature. Some places may be still open, and in these, matter will now form, and the vacuities will be filled up with new flesh, which may be seen sprouting up from the bottom of the wound. This appears red, and bleeds when touched. It sometimes rises above the skin, and is then often called proud flesh, but nothing need be feared from it. It may be pressed down by a compress of lint and the bandage. If it shoots out very far, it may be taken down by applying burnt alum. Over this, the scar at length forms.

Nothing for the purpose of promoting the healing process, should, on any account, ever be introduced into the wound; nothing is so congenial an application to the exposed flesh as the flesh itself; besides, any thing intervening between the lips of the wound is sure to defeat the process of union by the first intention.

3. Often, in a recent wound, there arises too much inflammation for the healthy process of healing. When this is the case, the parts will swell, become hot and painful. The patient should then loose blood, and be purged. Over the dressings which cover the part we should place a cloth wet with four parts water, and one of whiskey. This the dressings will imbibe, and the evaporation which will result, will reduce the morbid heat. If the pain continues, and be severe, a bread-and-milk poultice may be applied over the first dressings, and be occasionally renewed.

Should there, on the contrary, be but little excitement in the part, in consequence perhaps of a languid state of the system of the sufferer, and the part about the wound should be unusually cold and without sensation, warmth should be applied through the medium of warm cloths---or a warm poultice frequently renewed, and a little wine and water should be administered. The surgeon, however, should be obtained as promptly as possible.

Treatment of Lacerated and Contused Wounds.

Wounds in which the parts are torn and bruised are far more dangerous than simple cuts, although they are much less apt to bleed.* Parts near the wound are often disorganised and killed by the injury---or, if not thus destroyed, they are so injured that inflammation results which will terminate in mortification to some extent. These wounds, also, if neglected, are liable to terminate in tetanus (lock-jaw.)

*Limbs are sometimes torn from the body without any loss of blood.

In such injuries, we are not able to bring nicely into contact the ragged margins of the wound, consequently we do not expect to effect complete union by the first intention. We can generally, however, accomplish it to some extent, and should therefore always use the adhesive straps to bring the parts in as close apposition as possible. Then, as the parts will be insensible, and in a degree lifeless, we should apply warmth, by the medium of a soft warm poultice, or by cloths wrung out in a decoction of poppy heads, hops, or chamomile. The application of spirit and water, or warm wine, to the surface which can not be covered by the skin, also to the skin itself around the wound, is proper. Some employ, with happy effect, the oil of turpentine. These remedies not only rouse the vital energies of the part, but also prevent that morbid action and state of irritation in the nerves which prepares the way for lock-jaw.

In case a high degree of inflammation should result, bleeding and the cold lotions are to be resorted to, as I have before directed. Should mortification result from the severity of the inflammation, or from the destructive character of the injury, the best domestic application is the fermenting poultice. This is prepared of ground malt, two parts; rye flour, one part; these are to be boiled with water to the consistence of mush. There should then be added a small quantity of molasses; and a little yeast to begin the fermentation. The poultice should be large and not be renewed for 24 hours. The system must be sustained, in case the pulse should become feeble, with cordials and bark.

Lacerated wounds are most apt to result in tetanus when they are inflicted upon the foot, hand, and other

parts, the nerves of which are abundant, and which are otherwise complicated in their structure. Tetanus is also more apt to result from wounds of the foot, because this member is almost always imprudently used, it being impossible that it can be in a state of repose, if the patient be up at all. The wound, therefore, is liable to perpetual irritation.

To guard against this appalling disease from lacerated wounds, the injured part must be placed in a state of perfect repose. The oil of turpentine may be applied to that part of the wound which is exposed, and the member should then be enveloped in a warm poultice, which should be frequently renewed. Particular attention should be paid to the stomach and bowels, as tetanus rarely, if ever, occurs without some derangement of function in these organs. Mild cathartics should be occasionally given, and mild, unstimulating food should alone be allowed.

The symptoms of formidable tetanus occur usually from the 7th to the 9th day after the injury, and one of the first signs of its approach, is a degree of stiffness about the back of the neck and the jaws. The spasmodic affection, (cramp,) which occurs on the first or second day after a wound, is a far less formidable disease, and usually subsides spontaneously. True tetanus is almost always fatal.

Punctured wounds are to be treated in a similar manner.

Mode of Managing a Fractured Member till a surgeon can be procured.

If the thigh be fractured near the middle, the usual place of the injury, the nature of the mischief is easily discovered. If the patient be far from any dwelling, two boards, six feet long and a foot wide, should be placed side by side and be nailed to two cross-bars which shall extend one or two feet beyond the margin of the boards, and serve as handles. On this, place a mattrass, or blankets. Then carefully place the patient on the latter, inclining him to the side of the fracture, and placing the injured thigh on the outside. The thigh should be a little bent forward, and the leg bent on the thigh. A pillow should be put beneath the outside of the knee. He is thus to be conveyed to his dwelling; but his position must not be changed till the surgeon arrives.

When the leg is fractured below the knee, place three broad tapes, or strips of cloth, each a yard long, transversely on the mattrass or blankets ,about six inches apart. On these lay a towel, also cross-wise of the bed; then place a pillow on these, length-wise with the bed. Next, get two flat pieces of board, two inches wide, and longer than the leg. Lay the leg length-wise on the pillow, and double the pillow up on its sides; then fold the boards in opposite ends of the towel, and roll them over and over, till they press the opposite sides of the pillow upon the leg. Then the tapes should be tied in such a manner as to snugly embrace the leg. The patient should be placed on his back. The support will be more perfect if, by means of a piece of a hoop bent

over the leg, it be swung up so that the pillow shall not touch the bed.

If the arm be fractured above the elbow, place a small narrow pillow between it and the chest, and bind the arm gently to it by passing a towel around the body. The hand and arm below the elbow must be sustained in a sling, thrown round the neck.

When the arm below the elbow is broken, the sling alone is sufficient. These expedients, however, are to be regarded only as temporary, and as designed to prevent mischief till the surgeon shall arrive.

Treatment of Burns.

Almost every family has its nostrum for burns and scalds. There are a hundred applications, under which they have been seen to get well, and as the common prejudice is that nothing heals except by virtue of some application, each one would acquire some reputation though all were mischievous. No one has tried the experiment of doing nothing more than carefully protecting the part from the contact of the atmosphere, and from vicissitudes of temperature. What the result of such an experiment would be, we may infer from the fact that the most inert applications have generally the highest reputation, as oil—bats of cotton—water &c. But we will not contend with the good wives in regard to this matter. In slight burns, it is of little consequence which of the common remedies is applied. Nature is then able to conquer both the disease and the doctor. Nothing, however, is better than olive oil—a bread and

milk poultice, or if the skin be not broken, a bat of cotton.

But severe burns are fraught with danger, and it is earnestly to be desired that the community should possess more correct knowledge in regard to the use of means which ought to be instantly employed. Far be it from me to encourage domestic quackery where life is concerned; but as we know that in these cases fatal mischief is often done by erroneous applications *before medical advice can be obtained*, some knowledge in relation to this subject ought to be a part of every one's education.

It is not the deepest burn which is always the most dangerous. Those which are extensive, over the surface, are always alarming, even although the scarf-skin alone be destroyed. This is because of the extreme sensibility of the skin, and the shock which is therefore given to the nervous system, producing prostration of the powers of life.

The worst burns are produced by scalding liquids, which diffuse themselves over a wide surface; and by the burning of cotton or linen articles of dress. The first effect of the burn is a depression of the powers of life. The pulse becomes feeble—the face pale—the extremities often cold. Vomiting is apt to occur, and convulsions sometimes are produced in irritable children. This prostration often terminates in death, without any re-action. If the case be badly managed, for the first half hour, it may make all the difference between life and death. Here we must come in as the active auxiliaries of nature, and rally the flagging powers.

Most persons having observed the soothing influence

of cold applications to slight burns, it is by no means uncommon to apply them extensively in cases of which we are now speaking. They may, it is true, allay local pain, but they treacherously contribute to the depressing effect of the burn, these two extremes producing the same effect. I have known a child to be irrecoverably lost by the application of a large mass of scraped potatoes to the breast, in case of a burn which need not have been fatal. It ceased to complain after the application, and slept; but its sleep was the harbinger of death.

The object should always be, in such cases, to rouse the system to prompt re-action, by both general and local means. The part should be smeared as quickly as possible with oil of turpentine—warm vinegar—warm wine—or sweet oil;—then be covered with a cloth dipped in oil, or spread with lard, and enveloped in warm bats of cotton, or soft flannel. The camphorated tincture of opium (paregoric) should be given internally in liberal doses; or laudanum in doses, to an adult, of 60 drops; to a child of 5 years, 10 drops. Wine, or brandy-sling may be given in default of these, and may often be necessary in association with them. What remains to be done, in the province of the surgeon.

Mode of Extracting Foreign Substances from within the Eye-lids.

Sometimes an inflammation, fatal to the eye, is excited solely by the presence of some irritating substance, so fixed upon the surface of the eye-ball that it cannot readily be extracted. When the mote is loosely floating

in the tears, if it be not spontaneously washed away, it can be removed with great facility, by any one who has good vision and a steady hand. It may be brushed away with a piece of silk—the point of a feather, or a camel's hair pencil. When, however, there are numerous fine particles of dust in the eye, they are best removed by throwing within the lids a stream of warm milk and water.

But occasionally the foreign substance so conceals itself in the eye that, unless it be sought in a peculiar way, it escapes the keenest vision, and may remain, exciting severe inflammation, after its presence ceases to be suspected. I have learned from observation, that motes in the eye are exceedingly apt to conceal themselves just above and behind the border of the superior eye-lid,—attaching themselves closely to the eye-lid, and following it in all its movements; thereby creating more irritation than if they were fixed to the ball itself. The mote is liable to fix itself in this situation, because there is a slight concavity in the lid, above its margin. In a great many instances, in which individuals have suffered extreme annoyance for hours from the presence of motes in the eye, which could not be discerned, I have at once discovered the source of mischief, by seizing the eye-lashes of the upper lid with the thumb and finger of the left hand, and turning out the inner surface of the lid, so as to expose it to view. Then, with the blunt extremity of a needle, the point of a pencil, or other obtusely-pointed instrument, I have removed it.

Persons who are employed in grinding steel instruments, or in using such instruments upon stone, as, for instance, stone-cutters and millers, are exposed to a

species of injury which is often extremely destructive to the eye. A little pointed particle sometimes breaks from the edge of the instrument, and flies with the swiftness of shot into the eye---piercing the outer coat of the transparent part of the eye, or the white, and fixing itself as tenaciously as a barbed arrow. Sometimes it enters obliquely, and fairly buries itself in the membrane.

The usual means of removing motes from the eye will here be found altogether unavailing, and their frequent employment will only aggravate the irritation. If it be not removed, there will either result a diffused inflammation of the eye, or an ulcer will be produced, which will at length open the eye-ball and discharge its fluids.

It has been advised, in such cases, to apply the magnet to the particle of steel, and thus to elicit it from the eye. But this will never be found effectual when the mote is firmly fixed in the membrane. When it is possible, the patient should immediately seek assistance from the surgeon; but, when he cannot be procured, let some one who has a firm hand, take a sharp needle, or the very sharp point of a small knife, and, opening the eye-lids, endeavour to disengage the mote from its situation. This will sometimes require some force, and the repeated use of the needle. Sometimes it will be necessary to divide the external membrane slightly, with the point of a lancet. When this, or any other mote is removed from the eye, a bread-and-milk poultice should be applied, to sooth the organ. If inflammation arise, a rag, wet with cold water, should be kept upon it.

APPENDIX.

Since the pages of this volume were printed, describing the instrument which I employ in making the incision into the bladder in Lithotomy, I have used it in the case of Mr. James Longgon, of North Carolina. All that I had promised myself, in regard to its utility, was fully realized. The incision was made with one thrust of the knife, and I had my finger upon the stone in half a minute from the time that I took the instrument in hand. My patient is very rapidly recovering, nor has their occurred the slightest unpleasant symptom.

The director attached to the staff, represented in the plate, is not sufficiently long; and the part of the staff which is below its beak, should be a little more nearly straight.

N. R. SMITH.

INDEX.

THE END.

ERRATA.

The Reader is requested to correct with the pen the following errors:—

Page 49, second line from the bottom, (Note,) for *mentioned*, read *maintained*.

Page 122, fourth line, for *trochanter*, read *condyle*.

Page 144, sixth line from the bottom, read *the stiffest paper trunk-board that can be procured.*

Page 150, sixteenth line, for *four*, read *seven*.

Page 152, tenth line, for *with it to the upper*, read *with it the upper*, *&c.*

Page 157, fourteenth line, for *voluntary*, read *involuntary*, *&c.*

Page 239–40, strike out the quotations.